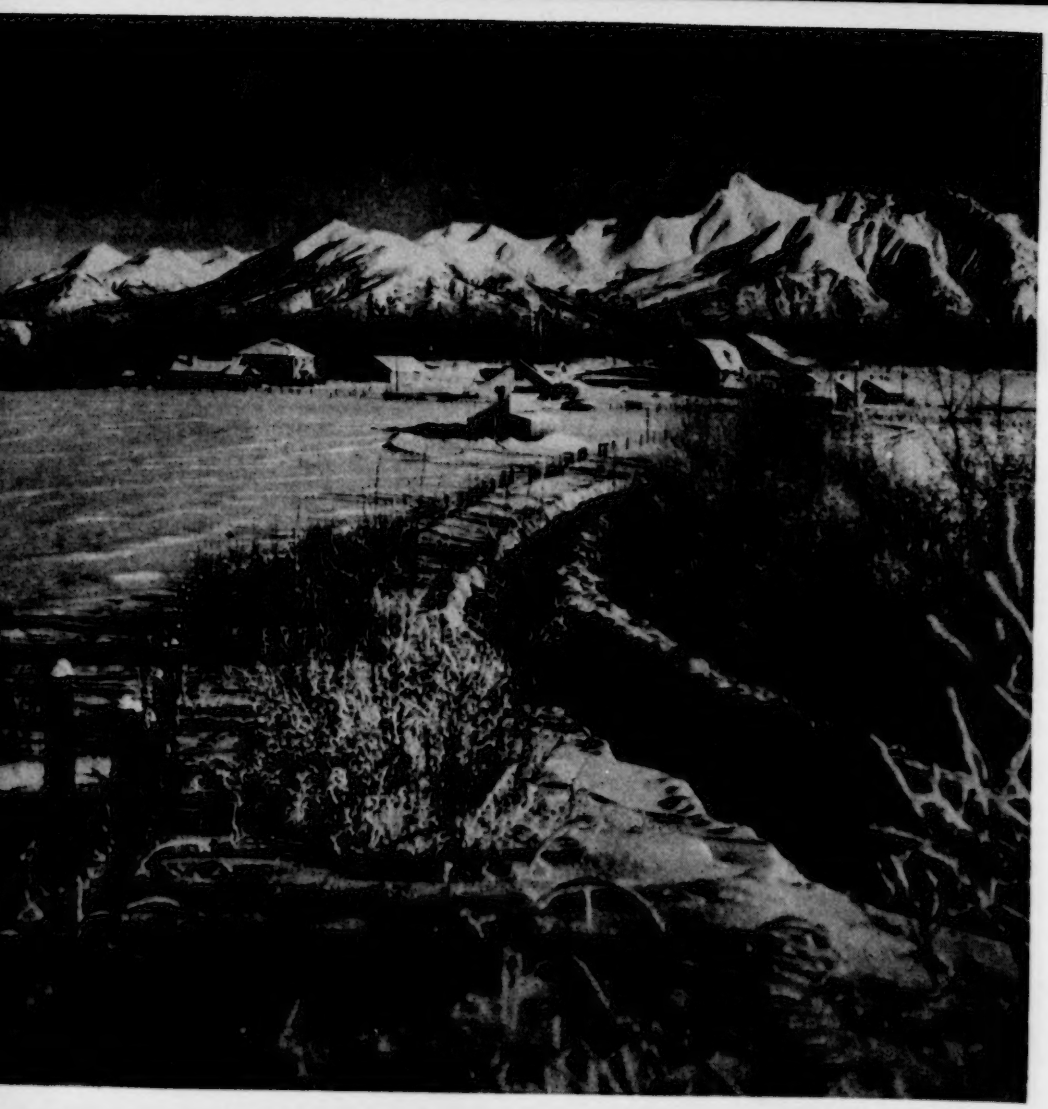

Volume 14, No. 1

January • 1959

Water Use and Rights

Stubble Mulch Studies

Practices Evaluated

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TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE

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COVER: To ALASKA, the Forty-Ninth of the United States! Winter's snow mantles the Matanuska Experiment Station Farm. These fields are usually blown free of snow by early February, exposing perennial crops. Chugach mountains in the background mark the east and south boundaries of the Matanuska Valley, colonized in the 1930's. Alaska has a wealth of natural resources, living wilderness, and some wonderful Eskimo-Indian natives. May the "science and art of good land use" be a guiding principle in Alaska's development.

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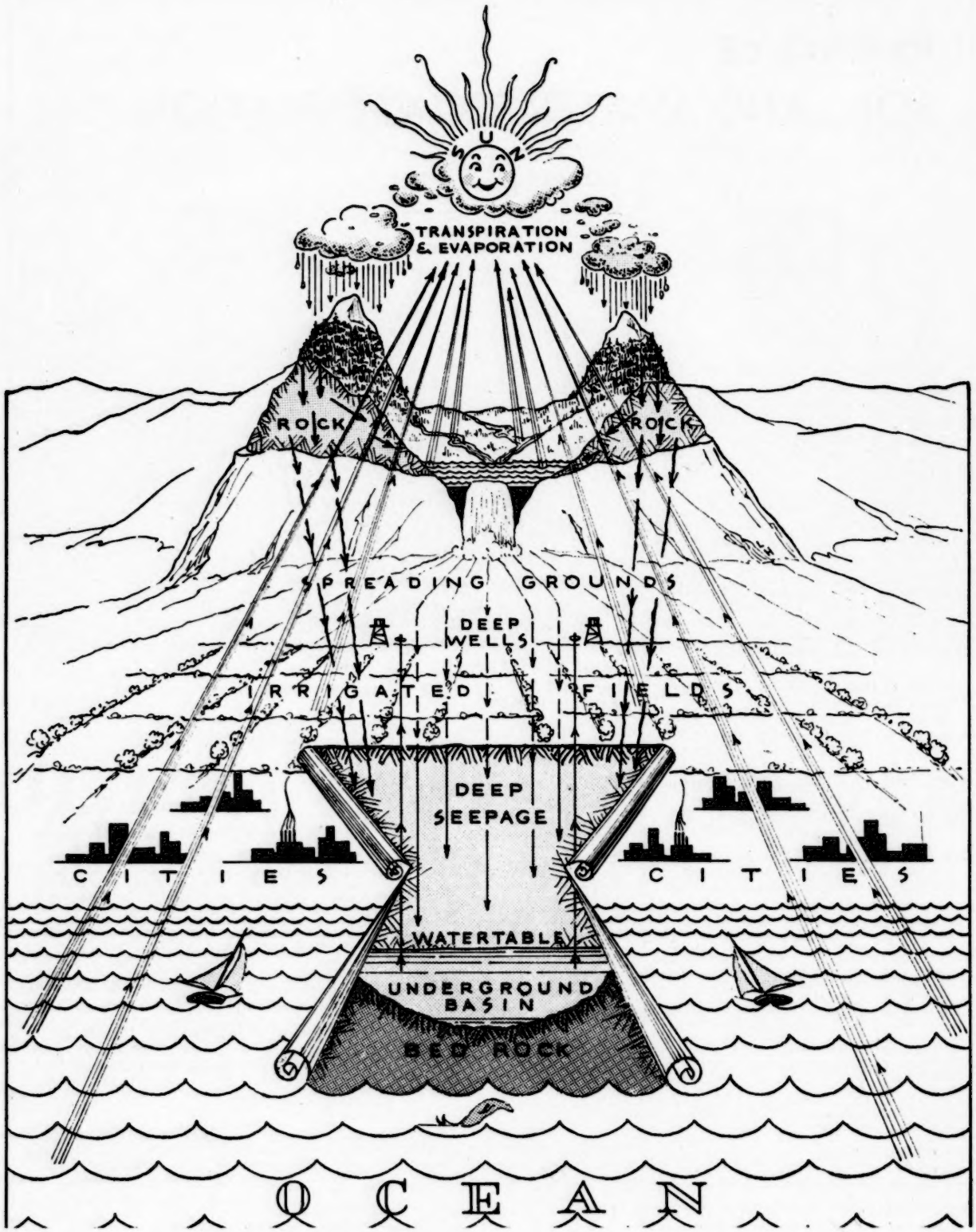


THE WATER CYCLE AS SHOWN PICTORIALLY FOR CALIFORNIA

Water-Use and Water-Rights Policy Is Changing

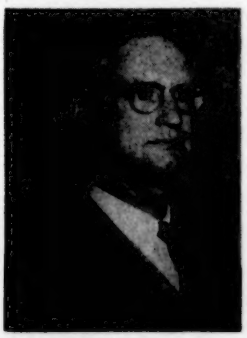
J. A. JOHNSON

EASTERNERS ARE TAKING A NEW LOOK at water problems and water-rights policies. In a surprising number of states, legislatures have declared new policies and are making progress toward modernizing administrative arrangements and programs of development and conservation.

Much has been said and written about water resources and the importance of their full development and utilization in the face of expanding human needs. The public is more aware of problems of water use, excess water, damage to water quality, and growing needs for greater quantities of good quality water in an expanding economy. People generally have some understanding of what is being done to solve these problems through conservation and protection programs. State legislatures and water-user organizations are assuming greater responsibilities for education on water facts, but many of us have little opportunity to develop an understanding of what is being accomplished state by state in approaching these problems through water policy legislation. It is the purpose of this article to give a brief summary of such accomplishments in the southeastern United States.

Studies Precede Action

In each of the southeastern states, in recent years, inter-organizational study committees, other water study committees, legislative policy commissions or designated state agencies, or more than one of these, have been active. As a basis of their studies, these committees and commissions in most cases inventoried problems. They also studied the nature and extent of supplies and analyzed needs, both present and future. Existing policies, administrative organizations, and programs, their own and those of other states, were studied in an effort to determine whether these facilitate orderly development, wise use, conservation and protection of supplies in the public interest.



J. A. Johnson is Water Program Needs Specialist, Soil Conservation Service, with headquarters at Spartanburg, South Carolina.

Findings, conclusions and recommendations were reported to their governors and legislatures. Some of the groups prepared specific legislative proposals. Most issued reports that were generally available to the public.

Results of Studies

These activities are bearing fruit in terms of a greater awareness by the general public of water-rights problems and legislative needs. In some southeastern states, water policies have been formally declared for the first time and water laws and programs have been adjusted in an effort to meet modern needs.

Studies are being continued in most cases. The people and their legislatures recognize that further adjustments will be necessary, if legal institutions and users are to keep abreast of changing conditions.

An act of the 1958 Kentucky General Assembly, for example, created a water resources study commission to conduct a continuous study and to develop a comprehensive law and amendments from time to time, ". . . to attain the maximum beneficial use of the water resources of the Commonwealth." The act said, in part: "Whereas, the changing wants and constantly increasing needs of the people as well as new problems, methods, and remedial programs require continuous study if the water resources of the Commonwealth are to be put to beneficial uses to the extent of which they are most reasonably capable and therefore the waste and unreasonable use of water prevented. . . ."

What Is Water Policy?

Before we attempt an answer to this question, "What is water policy?" let's think first in terms of purpose.

Basic purpose underlying most of a man's actions is to make either long-range or short-range adjustments to: (1) himself, (2) his environment, (3) his fellowmen, or (4) a higher being or order.

Such a classification may seem too simple to cover the whole complex of human activity. Nevertheless, a brief effort at cataloging some of man's actions reveals the classification's scope; especially when it is remembered that many of our activities are complex and interdependent. Both short- and long-adjustments can be in the nature of expediencies. Often man's short-range adjustments are expediencies.

With such a classification of basic human purpose in mind, declaration of water policy constitutes an effort by a group of people to adjust both to their environment (*the nature and extent of water resources*) and to their fellowmen (*the total of all water-user needs and prob-*

lems). Policy itself is a formal declaration by the people of a state or area of the basis upon which they intend to develop, use, conserve and protect the water resources for the general good.

How Does Policy Arise?

Water policy may be defined through a single act of the legislature, in which case it is usually broad and objective, often constituting a satisfactory long-range method by which adjustments to changing needs and problems can be achieved.

Declared policy can also be in the nature of a short-range adjustment, with the people ready to take limited action only. They may not be ready to spell out policy where problems are less critical or are too controversial. Declaration of policies by legislatures in such situations usually go as far as the people are ready to act, with the realization that the action is in the nature of an "expediency" until further study and new understanding can point the way to a broader long-range policy and new legislation. Policy may sometimes result from a series of legislative acts which can, or should, fit together.

In the absence of legislative action, policy may develop as a result of customs and court decisions over a period of years. In which case it may be clear and specific as applied to certain types of fact situations, or it may have to be interpreted from expressed or implied attitudes of the courts.

Water policy, to be fully effective, must be acceptable to the people or users to which it applies. Otherwise, they will ignore or circumvent policy in attempting to meet needs and in solving problems of use.

Generally speaking, the broader and the more fundamental a policy is, the greater its range of usefulness, both in time and degree. (This is in terms of the total water resources to which it applies and the basic principles guiding use and management.) A policy which meets these requirements may stand for centuries. It affords a basis for sound long-range adjustment to supplies and human needs. Policy principles developed under old Roman law are still in use today in modified form in sections of this country, having come down to us through French and Spanish Civil Laws. Civil law concepts developed out of customs and statutes over many centuries. Adaptations of principles embodied in the Napoleonic Code, coming down to us largely through the English Common Law, are in use today, especially in the eastern United States.

Occasionally a long-range policy must be modified after having served as a sound rule of guidance for many decades. Modifications occur generally where the amounts and kinds of uses change materially in relation to available supplies within a state or area. New needs and problems arise. The existing policy, either declared or implied, no longer serves as an adequate adjustment to resources and human needs.

Why Is Water Rights Policy Changing?

New needs and problems are arising in the southeastern states and in some northeastern and western states.

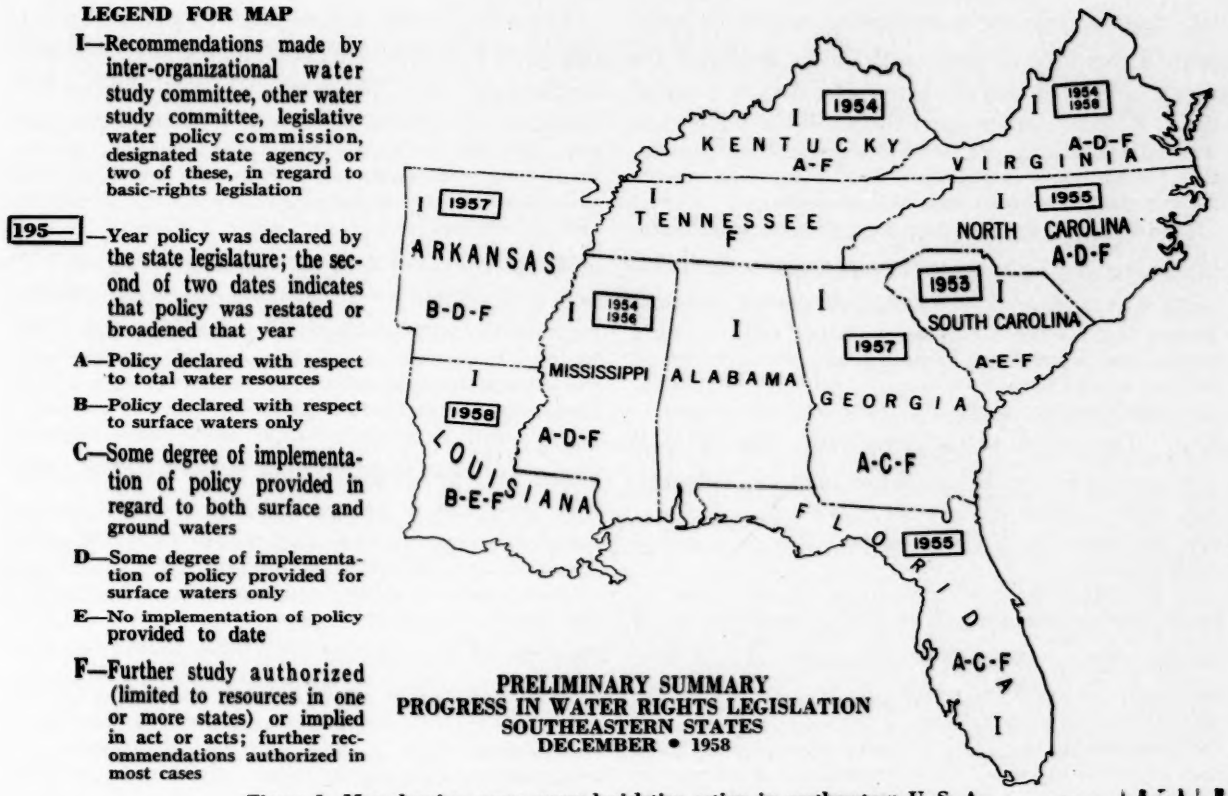
In the Southeast, rapidly expanding uses and needs coupled with the unprecedented droughts of the early 1950's focused attention upon new and more complex water use and management problems and brought about studies, recommendations and legislative action. Committee and commission members asked themselves such questions as: What is the nature, extent and quality of our water resources? What are our problems in regard to use, development, conservation and protection of water resources? Do present policies, administrative organizations and programs fully meet existing and future needs? And if not, how and in what direction should they be modernized?

It was found that water-rights policies and laws were mainly court-made and usually of many years past. In some states it was decided that existing policies and laws were largely implied. In a few states, decisions with respect to what attitudes the courts might take in resolving conflicts were based primarily upon evidence of trends and attitudes in neighboring states with comparable physical conditions and legal background. Policies, rules and doctrines were analyzed by the study groups in terms of whether they adequately met current water-use needs and water-rights problems. It was generally concluded that water users needed more adequate protection of investments, more specific rights of use, and more legal and administrative encouragement in attempts to develop, conserve and use water resources. Furthermore, it was felt that the needs of non-riparian (surface water) and in some cases non-overlying (ground water) landowners were not being fully met. There was need for greater protection and encouragement of seasonal storage, both on-stream and off-stream, and greater opportunity to use water on the better lands. And so recommendations were made by the study groups with respect to new policies and other legal adjustments.

Some Changes Underway

The accompanying map (Fig. 1) shows some broad details of recent legislative action with respect to water policy and implementation in 11 southeastern states.

The map indicates that formal action began with declaration of policy by the 1953 South Carolina General Assembly. Actually, interest in problems and needs developed in one part of South Carolina as early as 1945. That initial interest broadened and spread in succeeding


LEGEND FOR MAP
I—Recommendations made by inter-organizational water study committee, other water study committee, legislative water policy commission, designated state agency, or two of these, in regard to basic-rights legislation
195— —Year policy was declared by the state legislature; the second of two dates indicates that policy was restated or broadened that year
A—Policy declared with respect to total water resources
B—Policy declared with respect to surface waters only
C—Some degree of implementation of policy provided in regard to both surface and ground waters
D—Some degree of implementation of policy provided for surface waters only
E—No implementation of policy provided to date
F—Further study authorized (limited to resources in one or more states) or implied in act or acts; further recommendations authorized in most cases
KENTUCKY
A-F
1954
VIRGINIA
1954 1956
A-D-F
TENNESSEE
F
1957
ARKANSAS
B-D-F
1955
NORTH CAROLINA
A-D-F
1953
SOUTH CAROLINA
A-E-F
1954 1956
MISSISSIPPI
ALABAMA
1957
GEORGIA
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1958
LOUISIANA
B-E-F
A-D-F
FLORIDA
1955
A-C-F
PRELIMINARY SUMMARY
PROGRESS IN WATER RIGHTS LEGISLATION
SOUTHEASTERN STATES
DECEMBER • 1958

Figure 1. Map showing some recent legislative action in southeastern U. S. A.

years, resulting in the 1953 policy action and the creation of a Water Policy Committee, with responsibilities for further study and recommendations.

Questions and studies preceded declaration of policy from one to several years in all states. Initial interest and studies began in Florida in 1944, with policy declared by the Florida Legislature in 1955.

To complete the map story, it should be pointed out that although the General Assembly in Tennessee has not as yet made a formal declaration of policy, it has directed that studies be made of the ". . . said water resources looking toward the creation and development of a basic long-range water resource policy for the State . . . ," and that recommendations be made to the General Assembly in regard to policy and implementation.

One Tennessee act not only called for study and recommendations, but made provisions for a Water Engineer. He was authorized, among other things, to define and propose, if necessary, water control districts and to make engineering plans and surveys for improving the quantity of water supply in districts. He was further authorized to determine the feasibility of proposed dams and water diversion structures to conserve the basic water resources of the state and to review and recommend plans for any such proposed dams and diversion structures in any proposed water control districts. This might be considered implementation of anticipated policy, even though no formal declaration of water policy seems intended.

In Alabama, a voluntary study committee went to work in 1955 and submitted to the Governor a report entitled: "Alabama's Water Resources—A Plan For The Creation Of A Temporary Commission To Study The State's Water Resources And To Develop A Water Policy For The State." The committee made a second similar proposal in 1957. So far the Alabama Legislature has not acted favorably on these proposals.

Direction of Changes

Eastern states since pioneer days have followed adaptations of water-rights principles arising mainly out of landownership. These originated, as far as our immediate interest is concerned, in principles which came down to us mainly through the English Common Law.

Under the landownership theory of surface water rights, he who owns a piece of land touching a stream or

lake does not own the water flowing through his property. Rights vary in degree with the occurrence of the waters in question and the nature of use to be made of them. Without attempting to further define and explain these rights arising out of landownership, we can say that human needs in the East were served well enough as long as supplies well exceeded demands.

Many western states at first tended to follow this principle, also. But because stream supplies were short and needs in early days of settlement basically of a different nature, the western states began rather early to move toward the principle of beneficial use. Here, beneficial use and beneficial methods of use constituted the measure and limit of rights, rather than ownership and position of lands. This system of rights is usually referred to as *prior appropriations*. But transition from the landownership theory (where this rule was followed) to the beneficial use theory has not yet been made entirely in several western states.

In the Southeast, the *total* water supplies over the years have changed very little. But seasonal patterns of rainfall, even in so-called normal years, lead to *local* shortages. This has been especially true in view of the tremendous increases in demand for water supplies, and the deterioration in quality of water caused by sediment and wastes of all types. The situation is aggravated in drought years and is affected by new consumptive uses. Southeastern water users of all types in many areas often find themselves, from a practicable standpoint, in situations somewhat comparable to western conditions, where needs for water for beneficial uses exceed supplies.

It is not surprising, then, to find that in those southeastern states where policies have been formally declared by the legislatures, policy trends are toward beneficial use, conservation of supplies, encouragement of seasonal storage, and restrictions upon waste and unreasonable methods of use. But in each case the changes sought are with due regard to water quality problems.

This does not mean that southeastern states are adopting the western system of prior appropriations as such. Southeastern states (those which have provided implementation of declared policy) have adopted into their new laws one or more aspects of the western system. One is the general declaration of *reasonable beneficial use*. However, vested rights are recognized and defined. Certain features of the old English Common Law suitable to their conditions, as in Virginia, have been retained. Provisions have been made by several states for protection of certain stream flows and lake levels in the interest of domestic uses, recreation, fish and other wildlife, and water quality control. State agencies of one kind or other, depending on needs and customs, have been created to administer these new policies and programs. In other words, many of the southeastern states have attempted to develop policies, administrative arrangements and programs suited to their particular needs. Implementation of policy has been limited in most states to stream and lake waters, with attempts, mainly through definitions, to clarify and strengthen existing rules in regard to diffused surface waters.

Unless unforeseen conditions alter present trends, it can be anticipated that future years will bring further modifications of old as well as recent principles of surface water rights in the Southeast. More states probably will also provide policy and implementation with respect to ground waters. It has been said that needs and problems of the people, in the final analysis, shape their laws. The water-use needs and water problems of this entire section have changed materially in recent years. Such adjustments as prove necessary can be made with benefit of a vast background of experience existing in all states.

The results will be neither "Eastern" nor "Western" water law, as such. They will be adaptations of desirable principles, whatever their source, and development of some brand-new principles to meet local needs, state by state.

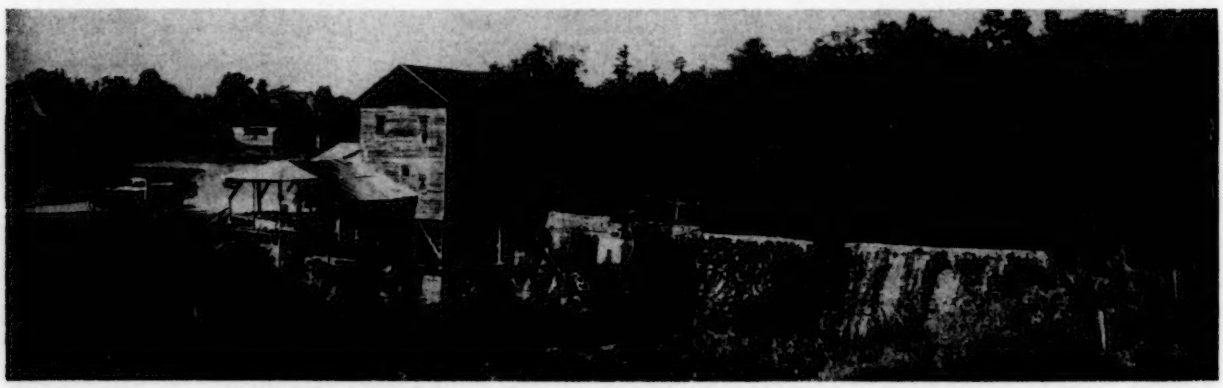

Figure 2. The Southeast is now involved in the development of some new water-use and water-rights principles to meet local needs, state by state.

Stubble Mulching In the Great Plains

F. L. DULEY

MODERN AMERICAN and European agriculture has developed around one primary tillage implement—the steel moldboard plow. When lands were new, or where erosion was not a big factor, most of the advantages in maintaining good tilth, controlling weeds, and providing a good seedbed were brought out by the use of this implement. With measurements on soil erosion and a greater interest in maintaining soil productivity on a permanent basis, some disadvantages of this modern type of plow were seen.

In work at the Missouri Experiment Station (3) published in 1923, it was shown that plowed land with no crop lost soil by erosion five times as rapidly as land growing wheat, 15 times as rapidly as land in a three-year rotation, and 125 times as rapidly as land in grass. Later investigations by workers in the Soil Conservation Service (4) at the University of Nebraska showed that plowed land in a three-year grain rotation lost about twice as much water by runoff and four times as much soil by erosion as land tilled with equipment that did not invert the soil or bury the residue from the previous crop. Under certain conditions the differences in runoff and erosion were even more striking.

The practice of preparing land for planting crops by methods which do not necessarily invert the soil nor bury the residue from the previous crop has come to be widely known as "stubble mulch farming." This system is effective not only for reducing runoff and water erosion, but is also effective and widely used in the control of wind erosion.

Research on Stubble Mulch

Experiments on the effects of stubble mulching on the condition and behavior of soils has been under study in Nebraska for the last 20 years. Work has been conducted in some other states for almost that long.

The effect of stubble left on the surface on intake of water, runoff and erosion have already been mentioned. There are a number of other conditions affected by leaving residue on the surface.

F. L. Duley is Soil Conservationist, USDA, ARS-SWC, in cooperation with the University of Nebraska, Lincoln, Nebraska. *This paper was prepared for presentation at meeting of American Society of Agronomy, Atlanta, Georgia, Nov. 18-22, 1957. Published with the approval of the Director as Paper No. 843 Journal Series, Nebraska Agricultural Experiment Station.*

Tests were made on the effect of residue on certain physical properties of the soil. Samples taken from plowed land, in comparison with land tilled with a subsurface tiller, have shown that on the stubble mulched land the degrees of aggregation (per cent aggregates $>$ .25 mm) has been increased in the surface three inches of soil. The stability of these aggregates was also increased (11).

Other tests have shown no significant difference between plowing and stubble mulching in bulk density, pore space, oxygen content of soil air, or resistance of the soil to penetration (10).

The surface inch of soil on the stubble mulched land has been found to contain a higher number of fungi (2) and other soil microorganisms than are present in the plowed land. The soil below this, or the one to six inch depth, showed no significant differences in these properties. Stubble mulched land also contained a greater number of earthworms and they produced a greater quantity of castings than in the plowed plots (12).

Easily soluble phosphate was also higher in the surface inch of soil under stubble mulching (14) than with plowing. The amount of nitrogen absorbed by corn plants was reduced on stubble mulching as compared with plowing. The absorption of calcium, magnesium, and sodium was about the same with each tillage method (13).

The nitrate content of the soil was usually slightly higher (approximately six per cent) with plowing than with stubble mulching (9). Some of the reasons for this reduced soil nitrate under stubble mulching are higher soil moisture near the surface and slightly lower temperature. Studies on soil temperature (8) have shown that on stubble mulched land the diurnal and seasonal variation in temperature is less than on plowed land. The temperatures in the surface inch on plowed land may run five to ten degrees Centigrade higher in mid-day than on mulched land, yet they would approach the same temperature at night. Stubble mulched land tends to warm up more slowly in the spring. For this reason, there may be good reasons for a little later planting of some crops.

Equipment

In the work at Nebraska much attention has been given to the development and use of equipment most suitable for stubble mulch work. In this a number of farm machinery manufacturers have given extensive and valuable cooperation.

After much field experience, a complement of equipment is now available that will enable farmers to prepare a satisfactory stubble mulch seedbed for any of the crops commonly grown in the Great Plains. In addition, equipment has been developed for seeding small grain or grasses through residue and for planting and cultivating row crops (Figures 1 and 2).

There is no one piece of equipment that is most satisfactory for basic tillage operations under all conditions. This means that a full complement of equipment is desirable for best results. Some of the experiments conducted on stubble mulching have utilized only one piece of equipment, which may not have been well adapted to the job, and a poorly prepared seedbed resulted. This has probably meant that in many cases the test was largely a comparison between "poor" stubble mulching and "good" plowing. In the work at Nebraska it must be admitted that this factor has affected the results to a certain extent during the early years of the research on this problem. It was necessary to learn to do good subsurface tillage, whereas the technique of good plowing is a well established practice.

There are many types of equipment that may have a valuable place in a stubble mulch program. However, the principal operations requiring special types of equipment are: (1) *The main tillage operation,* (2) *Working down the tilled soil—the secondary tillage,* (3) *Drilling small grain,* (4) *Planting row crops, and* (5) *Cultivation of row crops.*

Equipment for performing each of these operations satisfactorily is now on the market by a number of machine companies.

Control of Weeds

Weeds can be controlled by undercutting instead of plowing under, but it involves the use of some radically different principles. Undercutting at a shallow depth on a dry, hot day will cause rapid wilting and a complete kill of most weeds.

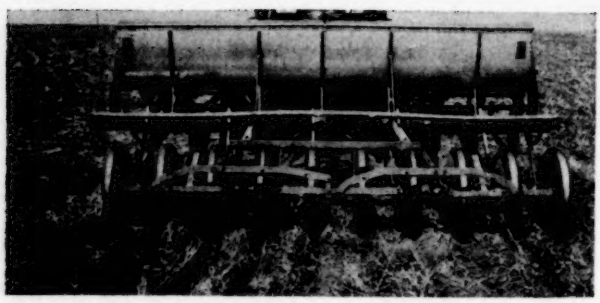

Figure 1. Shoe-type grain drill for operating through residue.

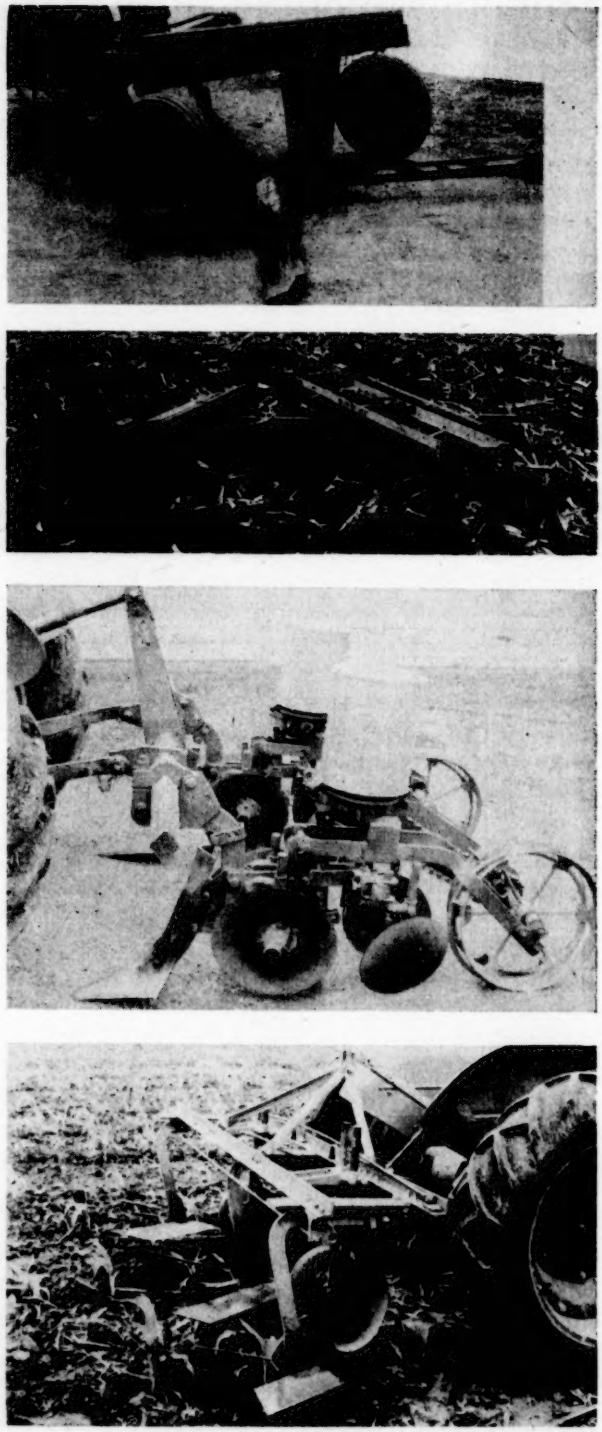

Figure 2 ***(top to bottom).*** **Single sweep subsurface tiller with 8-foot blade; mulch treader working through cut cornstalks destroys weeds and leaves surface in good condition for drilling; disk lister with small disks to open a deep, narrow furrow in which to plant row crops; three-sweep row-crop cultivator with disk hillers attached for working through residues.**

Shaker bars, loosely attached to sweeps or other equipment for undercutting the soil, may help greatly in separating the soil from the roots. This causes more rapid dying of the weeds.

One of the principles that should be most carefully followed in a stubble mulch system is to prevent the weeds from producing seed. In small grain stubble fields a shallow subtillage may be given at the proper time to prevent weed seed production and, at the same time, leave the stubble standing to catch snow and increase the chance for storing water in the soil. Keeping land free of weeds throughout the entire cropping system is good advice for any farming system, but it is particularly advisable in the stubble mulch system.

Maintaining Adequate Residue

In a stubble mulch system it is of great importance that a proper amount of residue be maintained at all times. It is possible to have too much residue on a field. There may be so much that it is difficult to work through, and it may hinder normal biological and chemical processes in the soil.

There seems to be no specific amount of residue that can be recommended, but 1,500 to 2,000 pounds per acre will give much protection to land against water or wind erosion. The amount needed will vary with the kind of residue and the extent to which it is anchored in the soil. Therefore, it is important that a farmer get a good idea of how this much residue looks on the soil and the quantity he wants left on the land at seeding time. He can then work toward this and usually approach very closely the amount desired (6).

If there is more residue on the land than is needed, it may be reduced gradually by decay during the period of seedbed preparation. Since the decay of residue is more rapid when mixed with soil, the decomposition can be hastened by working the soil with a disk, chisel, or other implement that tends to bury a portion of the material. In the case of exceptionally heavy residue, a part of it may be removed and still leave enough for soil protection.

In many cases, the amount of residue available is much less than needed for satisfactory protection of the soil against runoff and erosion. In such cases it is important that every bit of residue possible be preserved. Residue decays more slowly when not mixed with soil; therefore, a tillage implement should be used that will leave practically all the residue on the surface with only the slightest degree of mixing. As few tillage operations as possible should be performed. It is not only the covering of the residue by the sweeps that reduces the amount, but the treading and grinding action of the tractor wheels that tends to break and shorten the residue. Every trip over the land with machinery reduces the effectiveness of the mulch.

Different types of residue may require somewhat different treatments in the preparation of the seedbed for the next crop. In general, it is not necessary to have the residue cut or shredded into extremely small pieces. Wheat stubble from the combine can usually be handled without difficulty. Cornstalks or sorghum stalks cut into pieces a foot long give no trouble in preparing the seedbed, planting or cultivating. In fact, one type of machine attempts, with considerable success, to handle cornstalks without any special shortening by cutting. It is only necessary to give residue enough treatment so that implements work well through it. Usually the least difficulty is encountered when tillers are operated through residue where the stubble is still attached to the ground.

Crops and Yields Produced Under Stubble Mulch

Work at Nebraska has shown that any of the crops commonly grown in the Plains country can be produced satisfactorily under the stubble mulch system. Small grain, corn, sorghum, soybeans, sweetclover and other legumes, as well as alfalfa-grass mixtures, have all been grown by making use of this method. The mulch can protect the soil in great measure until the growing crop is up far enough to give protection to the land.

The effect of the stubble mulch system on the yields of crops depends on a number of conditions. Some of these are not fully understood, but progress is being made toward a more thorough knowledge. Climate may be a very important one. Suppose we assume Lincoln, Nebraska, as a starting point. If one should go west from Lincoln into areas of lower rainfall, or south into areas of higher temperatures, he would find stubble mulching to have an increasing response in yields in comparison with plowing. An article by McAlister (7) shows some of the more recent ideas about using this method in the Southeastern states.

On the other hand, if one should go east from Lincoln where the rainfall is higher, or north where the temperature is cooler, stubble mulching might be expected to have a depressing effect on the yields of some crops as compared with plowing. Its use there may have to be confined to special crops or conditions. In some areas long wet spells, coupled with low temperatures, are common in the spring. Such conditions occasionally occur at Lincoln and have been found less favorable for stubble mulching. Stubble mulching was designed originally and primarily for areas where water conservation is important. Therefore, if the problem is to get rid of water, drainage may be the solution.

In the work at Lincoln, a number of rotations have been used in which sweetclover has been included as a

legume crop. In another area of this field a grain rotation of corn, oats, wheat has been used without any legume. A number of the legume rotations have been continued through a 10-year period. The non-legume rotation has been run for 18 years.

In order to have a direct comparison between yields of crops under subtillage and plowing during the same seasons, eight years were used between 1948-1956. The results are shown in Table 1.

TABLE 1

Crop Yields on Subtilled and Plowed Land in Legume and Non-legume Rotations (Bushels per acre)

		Corn[a]		Oats[b]		Wheat[a]	
Yrs.	Cropping System	Sub-tilled	Plowed	Sub-tilled	Plowed	Sub-tilled	Plowed
8	Sweetclover rotations	53.2	54.3	45.2	49.4	33.7	33.8
	Increase for plowing	—	1.1	—	4.2	—	0.1
8	Corn, oats, wheat	42.1	46.6	23.3	24.9	20.4	22.5
	Increase for plowing	—	4.5	—	1.6	—	2.1
	Increase for legumes	11.1	7.7	21.9	24.5	13.3	11.3

[a]1947-1955, with 1952 omitted.
[b]1948-1954.

It may be seen from the mean yields of corn and wheat that there was little difference in yield between subtilled and plowed land in the legume rotations. There was a 4.2 bushel increase for plowing on oats. This can probably be explained for two reasons: (1) With the grain drills used during most of the period, the job of drilling done through chopped cornstalks on the surface was not as uniform as where the stalks had been plowed under; and (2) sweetclover seeded with the oats usually gave a thicker stand on the subtilled land and therefore offered more competition for the oats.

In the grain rotation without legumes, the yields of oats and wheat showed only very slight differences due to method of tillage. Corn gave a 4.5 bushel increase for plowing. This was probably due primarily to the plowed land having a slightly higher nitrate content when the corn was making its early growth on this soil which was not in condition to supply nitrate in large amounts. It was due also in part to the great number of high rainfall years, which gave an advantage to plowing as shown in Table 2.

TABLE 2

Yields of Corn in Corn, Oats, Wheat Rotation

	Yield—Bushels per Acre		
	Subtilled	Plowed	
Moisture Conditions	Residue on Surface	Residue Removed	Residue Under
Mean yield—Six dry years[a]	38.5	28.6	33.3
Decrease for plowing	—	9.9	5.2
Mean Yield—11 wetter yrs.[b]	46.1	52.1	54.3
Increase for plowing	—	6.0	8.2

[a]1939-1941 and 1954-1956.
[b]1942-1953. 1952 lost.

In general, it may be said that under the conditions at Lincoln during the period of these experiments, there has not been a statistically significant difference in the yield of crops between subtillage and plowing. There has been a rather consistently slight increase for plowing, at least on the years with normal or higher rainfall. Although this increase has been small, it may indicate a real difference, but is undoubtedly offset by the greater control of runoff and erosion which is afforded by the stubble mulch system.

The plots in the legume rotations and the non-legume rotation are in separate tests and, therefore, are not directly comparable even though they are in the same field. Nevertheless, the differences are so striking that they merit some attention. The increase in grain yield due to sweetclover over the non-legume rotation is substantial for all crops. The greatest proportional increase was on oats. Here the yield was about doubled in the legume system.

The relation between weather conditions and corn yields on stubble mulched and plowed land may be illustrated by results from a corn, oats, wheat rotation during years with different moisture conditions.

This relative improvement in yield of corn on stubble mulched land during years when moisture was limited may be partially explained as follows: In the early part of the season the growth of corn plants may be held back slightly on the stubble mulched plots due to slight repression of nitrate production. Thus the plants require less water. Secondly, the saving of some water on the soil after an occasional rain during the growing season may have been sufficient to give an advantage to the stubble mulched land.

During wet years, or when rains come about as needed, the plowed land has given the higher yields. This would indicate that in areas where dry years are more common than wet ones, the stubble mulch system has much greater chance for success.

In the case of wheat, it has been shown from the results of a number of stations (15) distributed over much of the western part of the country that the relative advantage of stubble mulching over plowing increases from humid toward more semi-arid conditions.

Effect of Fertility

Yields of crops on stubble mulched land are affected by the supply of available nitrogen. This may be increased through the use of legumes or by supplying nitrogen fertilizers. Observations on the results of work so far have led to two general conclusions: (1) When the supply of nitrogen in the soil is low and the extra inversion and stirring by the plow may increase nitrification, plowing usually gives higher yields; (2) when fertility and moisture conditions are favorable for maximum production, the yields from stubble mulching may be as

high as from plowing. This is shown in Table 3 which gives a brief summary of three years results with different fertilizer treatments.

TABLE 3

Effect of Fertilizer Treatment on Yield of Corn on Subtilled and Plowed Land. Mean of Three Years Results, 1953-1955[a]

	Subtilled				Plowed			
Year	Ck.	8-32-0 Starter	Starter: +80#N[b]	80#N[b]	Ck.	8-32-0 Starter	Starter: +80#N	80#N
1953	48.2	47.7	54.6	61.0	53.6	55.4	59.8	57.7
1954	45.1	46.6	48.5	48.3	45.1	46.7	46.1	45.9
1955	31.2	31.6	26.7	31.1	31.8	28.4	16.5	18.4
Mean	41.5	42.0	43.3	46.8	43.5	43.5	40.8	40.7
Increase for plowing					2.0	1.5	−2.5	−6.1

[a]Each yield is the mean of four plots.
[b]Nitrogen applied second cultivation, in ammonium nitrate.

Table 4 shows that the yields of corn following different legumes is slightly higher on the plowed land. However, the difference is much less than where corn was grown without a legume. This seems to be a further illustration that the plow, by doing a little more stirring and more thoroughly incorporating the residue than the subtiller, gives a little more nitrate on land with a low amount of nitrifiable material.

TABLE 4

The Effect of Different Legumes on the Yield of Corn in a Corn-Oats + Legume Rotation. Mean of 3 years, 1950-1952

Legume	Tillage	Mean Yield Bu./A.	Mean Increases Legumes over Check	Plowing over Subtillage
Biennial Sweetclover	Subtilled	69.3	26.7	2.7
	Plowed	72.0	19.4	
Vetch	Subtilled	69.8	27.2	
	Plowed	73.3	20.7	3.5
Annual Sweetclover	Subtilled	61.0	18.4	
	Plowed	63.8	11.2	2.8
Partridge Pea	Subtilled	58.7	16.1	
	Plowed	61.1	8.5	2.4
Lespedeza	Subtilled	61.6	19.0	
	Plowed	67.0	14.4	5.4
Check—No Legume	Subtilled	42.6	—	
	Plowed	52.6	—	10.0

Wind Erosion

In the Great Plains region of the United States and Canada, stubble mulch farming has been found to have the additional advantage of controlling wind erosion. Much technical work has been done on this question. Wind tunnel tests by Chepil and others in Kansas and Saskatchewan have shown the relative erosiveness by wind of different soils, tillage conditions, and amount of cover (1).

It has been known for a long while that almost any soil, regardless of texture, may sometimes get into such physical condition that it will be subject to wind erosion in the Great Plains. The peculiar effects of wetting and drying and of freezing and thawing, in producing a soil condition susceptible to wind erosion has not been satisfactorily explained. The chief concern so far has been "what can be done to prevent the disastrous effects of wind erosion."

The use of the stubble mulch system has been widely demonstrated to be a most feasible method of reducing wind erosion on cultivated land. A vast amount of practical experience by farmers has also shown that stubble mulching can give effective control against wind erosion. This can be attained by keeping a reasonable amount of crop residue on the surface until the next crop is well started and has made sufficient growth to cover the soil. Since much of the wheat in this area is produced under a wheat-fallow system, the residue must be held on the land in adequate quantities for about 20 months (5).

Summary

It seems safe to say that this stubble mulch farming is one of the most dependable steps that can be inserted in a soil and moisture conservation program. *However, it should be pointed out that this system must not be relied upon as a complete program in itself. It should be combined with all the other good practices that we know.* A proper cropping system, terraces and contour farming where needed, along with stubble mulching, will provide the most effective protection against runoff, water and wind erosion that we have. With proper use of fertilizers and legumes, satisfactory yields of crops can be maintained while preserving the soil as a permanent agricultural resource for the future.

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Evaluation of Conservation Performance

CALVIN C. BOYKIN, JR.

A METHOD FOR EVALUATING conservation performance of soil conservation district cooperators was developed by the Texas Agricultural Experiment Station during 1955-1956 in a study of obstacles to the application of soil and water conservation practices on tenant-operated farms (1). Landowners and tenants of the 26 farms studied were cooperating with the Navarro-Hill Soil Conservation District and were receiving technical assistance from the Soil Conservation Service work unit at Corsicana. Although tenant-operated farms have declined from over 70 per cent in 1930 to about 40 per cent in 1954, tenure-associated problems in achieving progress in the application of needed soil and water conservation practices still exist.

Supervisors of the District, and SCS work unit conservationist Jack Everhart and his staff at Corsicana generously provided materials and assistance essential for the study.

The purpose of this paper is to explain how the conservation performance rating system was developed; how it was used in the study of tenant-operated farms under agreement with the District; and how it may be used in identifying other problems relating to progress in the application of a soil and water conservation program.

The Navarro-Hill Soil Conservation District is located in the Blackland Prairie area of Texas where the major farm enterprises are cotton, corn, small grain, and livestock. The soils are deep, black and fertile, but highly susceptible to erosion. The District includes all of Navarro County, 697,600 acres; the north one-seventieth of Freestone County, 79,000 acres; the northeast one-twentieth of Limestone County, 39,500 acres; the east one-third of Hill County, 203,000 acres; and the southwest one-twenty-fifth of Ellis County, 24,000 acres; a total of 1,043,700 acres (2).

Technical assistance in planning and applying needed soil and water conservation has been available to the District from the SCS through a memorandum of understanding with the U. S. Department of Agriculture of August, 1940. Five work unit offices of the SCS located at Corsicana, Hillsboro, Kerens, Wortham and Hubbard, provide assistance to farmer-cooperators in the development and application of soil and water conservation plans.

Basic conservation plans had been developed with 2,580 of the 3,791 farmers cooperating with District at the time the study was made (3). Of the 2,580 basic plans developed, 188 had been applied. Important permanent-type conservation practices commonly needed in the District include terracing, and farm pond, diversion and waterway construction. Contour farming, cover cropping, stubble mulching, and seeding of pasture are temporary-type practices commonly needed.

Method Used

The basis for calculation of the conservation performance rating was the conservation plan for the farm, developed by the farmer with the SCS technician, and the farmer's performance in applying the practices. To provide a comparative basis of evaluation, the individual's performance was measured in relation to what the group had accomplished. To have comparable individual cooperators, two requirements had to be fulfilled. First, the cooperators selected for study must have had a conservation program in effect long enough for most of the needed conservation practices to have been planned. The time varied from a few weeks, where a basic plan was developed in the first series of farm visits by the SCS technician, to as much as two years. Second, these farmers must have been cooperating with the District for a sufficient length of time for most of the planned conservation practices to have been applied. Completion of all planned practices required anywhere from two to five years. Weather and general economic conditions had a great effect upon the rapidity with which cooperators were able to carry out planned practices. A relatively new plan in the initial stages of planning and application could not be evaluated with this method.

Over 18 different conservation practices were recommended as being needed in various degrees throughout the Navarro-Hill Soil Conservation District. The determination of these conservation needs was an activity of the U. S. Department of Agriculture under the leadership of the SCS with the cooperation of the Texas Agricultural Experiment Station and Extension Service.

In any evaluation process, a problem is posed by the necessity of combining practices measured in different units. Some of the practices are reported in the SCS files by number, as are waterways and farm ponds; some are

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reported in feet or miles, as are diversions and terraces; others are reported in acres, as are contour farming and cover cropping. Also, different levels of difficulty in application are present between the various conservation practices and between the same practice on different farms. Some practices cost more to apply than others; some are associated more with normal farming operations and do not require much additional effort for establishment. All of these factors make the rating of an individual's or a group's conservation performance difficult. Some of these difficulties were recognized by Zwerman and Prundeanu (4) while attempting to find possible reasons for farmer acceptance or non-acceptance of soil conservation in Pennsylvania. In their study, conservation practices were classified into three groups depending upon whether annual maintenance requirements were fairly high, moderate, or few, once the practices were established.

Here is the method developed in the Texas study to combine conservation practices, weight them and arrive at a numerical rating. Each of the 18 conservation practices were examined to find out how the group as a whole performed. For instance, each cooperator who planned the cover cropping practice was listed according to the acres of cover cropping planned and acres applied (see Table 1). If a cooperator did not plan cover cropping, the assumption was made that this conservation practice was not needed and no credit was given or taken away from the group or the individual in that particular case. The acres for all cooperators who planned cover cropping were totaled. Similarly the acres of cover cropping applied by the group were totaled. In this instance, the total acres of cover cropping planned was 4,537. The total acres of cover cropping applied was 3,743. Dividing the total 3,743 by the total 4,537 resulted in 82 per cent, which was the group rating for cover cropping. To obtain the weight for the practice, the percentage applied by the group was divided into 1. One divided by 82 per cent equals 1.22. This was the group performance weighting factor. If there was a low rate of application which resulted in a low percentage performance for the group, the group performance weighting factor was greater. For instance, there was a relatively low percentage performance on terracing, 32 per cent. Dividing 32 in 1 resulted in a group performance weighting factor of 3.12. Hence more credit or weight was given to the individual who carried out this practice which so few carried out.

TABLE 1

Example of the Derivation of a Group Performance Weighting Factor for Cover Cropping

(1) Cooperator Number	(2) Amount Planned (acres)	(3) Amount Applied (acres)	(4) Percentage of Planned Applied
2	280	280	100
1	0	0	—
5	104	0	0
4	174	100	57
8	98	98	100
10	362	362	100
15	244	244	100
20	362	362	100
3	319	319	100
6	860	860	100
7	42	42	100
9	50	10	20
11	105	45	43
19	46	46	100
18	130	30	23
16	187	77	41
17	35	0	0
26	200	50	25
24	364	364	100
21	96	0	0
22	20	20	100
23	30	30	100
25	35	35	100
12	95	95	100
13	239	239	100
14	60	35	51
Total	4,537	3,743	

$$\frac{\text{Total amount applied } (3{,}743)}{\text{Total amount planned } (4{,}537)} = \text{group rating for cover cropping } (82)$$

$$\frac{1}{\text{group rating } (82)} = \text{group performance weighting factor } (1.22)$$

Ordinarily one would expect terracing to be more costly because of the reorganization of farming methods it requires and for other reasons. Under this system of rating more weight was earned by individuals who applied a high proportion of terracing even though other, more easily applied practices may have been left uncompleted. Other practices which received more weight were generally of a permanent nature such as waterways and some temporary practices such as seeding of pasture, contour farming, and brush control (see Table 2).

Following the derivation of a group performance factor for all 18 conservation practices, a conservation performance rating was calculated for all 26 cooperators in this particular group. The individual conservation performance rating was calculated by multiplying the percentage applied of the amounts planned of each conservation practice by the group performance weighting factor for the practice. The product was the individual conservation performance rating for one practice. For instance, cooperator Number 2 planned 153 acres of contour farming but only applied it to 60 acres, leaving 93 acres needing treatment. This cooperator applied 39 per cent of what he had originally planned to do. Multiplying 39 per cent times the group performance weighting factor of 2.17 resulted in an individual conservation performance rating of 0.85 for contour farming. Treating each conservation practice in a similar way, a conservation performance rating was obtained for cover cropping, stubble mulching, seeding of pasture, and all other planned conservation practices. To compute the individual's conservation performance rating, the sum of all the resulting individual conservation practice ratings was obtained. The sum of the individual conservation practice ratings for cooperator Number 2 was 16.16. This sum was divided by the sum of the group performance weighting factors, which was 23.54. This dividend was 69. This figure was the individual coop-

erator's conservation performance rating. If cooperator Number 2 had planned fertilization, 1.33 would have been added to the group performance weighing factor. Similarly, if brush control had been planned, 4.54 would have been added, and if pasture improvement had been planned, 1.64 would have been added. Thus the possible total of all weighting factors would have been 31.05. Since all cooperators in most cases planned various numbers of practices, the total of each's weighting factor was different and a different total of weighting factors was divided into the total of individual conservation practice ratings each time. This rating indicates how the cooperator performed in relation to what he and the SCS technicians planned in the way of needed conservation practices, and his conservation performance in relation to other cooperators within the group. The top conservation rating attainable using this method of evaluation was 100. In this example, three of the 18 recognized practices for the area were not planned and thus assumed not to have been needed on this particular farm. Fertilization, brush control, and pasture improvement were not planned and were omitted from the calculation.

TABLE 2

Method of Calculating an Individual's Conservation Performance Rating (Cooperator No. 2)

(1) Conservation Practices	(2) Unit	(3) Amount Planned	(4) Amount Applied	(5) Per cent of Planned Applied	(6) Group Performance Weighting Factor	(7) Individual Conservation Practice Rating
Temporary Practices:						
Contour farming	Acres	153	60	39	2.17	.85
Cover cropping	Acres	280	280	100	1.22	1.22
Stubble mulching	Acres	453	453	100	1.23	1.23
Seeding of pasture	Acres	485	135	28	2.94	.82
Wildlife area imp.	Acres	200	200	100	1.17	1.17
Wildlife area treat.	Acres	200	200	100	1.02	1.02
Proper use	Acres	585	585	100	1.39	1.39
Rotation grazing	Acres	640	640	100	1.37	1.37
Water facilities	Number	1	1	100	1.41	1.41
Rotation hay and past.	Acres	50	50	100	1.01	1.01
Fertilization	Acres	0	0	—[1]	1.332	
Brush control	Acres	0	0	—[1]	4.542	
Pasture improvement	Acres	0	0	—[1]	1.642	
Permanent Practices:						
Diversions	Feet	3200	3200	100	1.25	1.25
Waterways	Number	2	1	50	2.04	1.02
Farm ponds	Number	5	4	80	1.20	.96
Sod spur or dam	Acres	3	3	100	1.00	1.00
Terraces	Miles	6.25	.9	14	3.12	.44
Total					23.54	16.16

[1]Conservation practices not planned
[2]Omitted from total of column (6) since these conservation practices were not planned.

$$\text{Individual's Conservation Performance Rating} = \frac{\text{Total of column (7)}}{\text{Total of column (6)}} = \frac{16.16}{23.54} = 69.$$

Testing the Importance of a Single Factor

Once the conservation performance ratings are obtained, numerous uses may be made of them. In the Texas study, analyses were made concerning various tenure relationships that were thought to have had a bearing on conservation performance on tenant-operated farms. Information concerning these factors was obtained from personal interviews with both the landowners and tenants who operated the 26 farms under study who were cooperating with the District. The question of whether the landowner and tenant discussed the conservation plan or not was thought to have had an effect on the degree of success in the application of conservation practices. Many plans are developed with the landowner and call for changes in the farming system that cannot be initiated without participation by the tenant. Most plans are made with the landowner; however, some plans are made with the tenant since the landowner is non-resident or otherwise unable to materially participate in farming decisions. Many practices, especially those of a permanent nature, which may be considered capital investments in the land, have little chance of being applied unless close cooperation is obtained from both landowner and tenant. The foundation for a satisfactory tenure arrangement rests largely on adequate discussion of what each expects of the other. This often leads to better tenure security and greater cost-sharing of expenses in proportion to expected returns.

To test the importance of these discussions between landowner and tenant, all cooperators who discussed their plans were placed into one group and those who did not were placed into another group (see Table 3). As determined by the interviews, there were 15 cases in which discussions took place and nine cases in which there were no discussions. In two cases, no answer was obtained concerning this particular question.

All the individual conservation performance ratings were totaled and averaged for both groups, in order to compare the two groups and determine the importance of the discussion factor between landowner and tenant. The result was that the group in which landowner and tenant held discussions concerning the conservation plan, the average conservation performance rating was 77.

The group in which these discussions were not practiced had an average conservation performance rating of 30. Apparently this factor is important in the performance of needed conservation practices. Testing the significance of the difference between these two averages, assuming that the two groups were drawn from populations normally distributed and having equal variance, indications were that the difference was significant at the .01 level with 22 degrees of freedom. (5)

Additional Uses of the Evaluation Method

These techniques may also be used to evaluate other aspects of tenure relations which affect conservation progress. In the Texas study, this method was used to evaluate the importance of size of farm, type of soil, cost-sharing of conservation expenses, type of rental arrangement, and security of tenure. All of these factors were found to be important in the amount of conservation practiced under the District program.

In addition to tenure questions there are a number of other questions which may be answered by use of these techniques. It should be very useful to study the effect of part-time farming and outside sources of income on the rate of application of soil and water conservation practices. Various credit practices for initiating conservation practices could also be evaluated, as well as the possible effects of deductions from the farmer's income tax for specified conservation expenses. The effect of the level of education and cultural differences among farmers engaged in conservation programs is another interesting possibility for analysis.

District officials, SCS technicians, and others charged with the responsibility of getting conservation applied on the land can use the method developed in the Texas study. The method offers a critical analysis of planning methods and on-farm assistance in the implementation of various conservation practices. A system based on this method of rating may also be used in comparing certain conservation performances of one district or state with another.

TABLE 3

Significance of Landowner and Tenant Discussions Concerning Conservation Plan

Landowner and Tenant Discussed Conservation Plan		Landowner and Tenant did not Discuss Conservation Plan	
Cooperator Number	Rating X	Cooperator Number	Rating X
1	100	10	88
5	100	3	41
6	100	23	37
7	100	18	34
8	100	16	26
9	100	14	18
4	97	12	10
24	93	22	9
21	88	20	4
2	69		
11	59		
15	48		
17	47		
19	39		
13	14		
	1,154		267

$N_1 = 15$ = Number of cooperators in group $N_2 = 9$ = Number of cooperators in group

$\bar{X}_1 = \frac{\Sigma X}{N_1} = \frac{1,154}{15} = 77$ = Average group conservation performance rating $\bar{X}_2 = \frac{\Sigma X}{N_2} = \frac{267}{9} = 30$ = Average group conservation performance rating

$t = 4.0467$ Difference between the two averages significant at .01 level with 22 degrees of freedom.

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Figure 1. Ben Dossey, Navarro Hill SCD cooperator *(right)* and Roy Roberts, tenant *(left)*, check a Sutter's fescue grass outlet with Blondell Woolridge, SCS technician. The outlet serves 60 acres of terraced land and is used for periodic grazing and seed production. How would you evaluate this? The author explains a method.

Tomorrow's Professional Conservationist

D. A. WILLIAMS

OUR CONCEPT of soil and water conservation has broadened through the years. Without doubt, it will take on still different form in the future.

Many of the techniques by which soil and water conservation is achieved have undergone change. New techniques will certainly continue to be added in years ahead.

But the men and women who devote themselves to a conservation career still give to it the same full measure of zeal and dedication they always have. How fortunate it is that in every generation there are these increasing numbers of people who find in conservation enough satisfaction and challenge that they are willing to spend their lifetimes in such service.

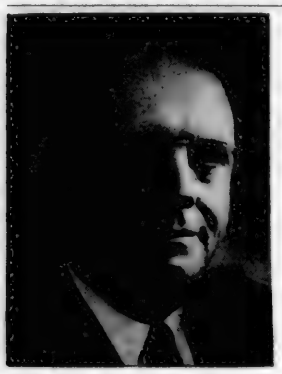
Before we can discuss the topic "The Professional Conservationist of Tomorrow" we need to speculate a little on the nature of the conservation job he will be called upon to do.

"Speculate," however, may not be the correct word. Tomorrow's land and water problems, in truth, stand out rather clearly before us today. Scientific progress and population growth are accelerating so rapidly that "today" becomes "tomorrow" before we know it. We have all too little time to do the things we know will be needed to insure adequate quantity and quality of soil and water for tomorrow's living.

New Concepts Affecting Conservation

Let us take a look at some of the concepts and developments emerging today which help to point up the nature of tomorrow's soil and water conservation program.

Perhaps one of the most significant developments is that rural problems are no longer necessarily agricultural problems. Much land needing conservation treatment is no longer farm or ranch land. The intermingling in rural areas of farm and non-farm residents and agricultural and non-agricultural enterprises is creating a different group of people with whom the soil conservationist must deal in his work.



D. A. Williams is Administrator of the Soil Conservation Service, Washington, D. C. This paper is adapted from a talk he gave before the 13th Annual meeting of the SCSA at Asheville, North Carolina, October 22, 1958.

At the same time, this intermingling creates new or different kinds of physical problems which come to the attention of the conservationist. As extensive rural acreage is taken over by factories, airports, racetracks, highways, and housing developments, there arises a complexity of problems relating to soil stabilization, sedimentation, drainage, sewage disposal, pollution, tax adjustment, competition for water and many others. Some of these call for the attention of the agricultural conservationist. Others will be dealt with by planners and technicians attached to local government. But frequently both areas of interest are involved. Land is rapidly becoming a major resource in terms of space, as well as a source of food and fiber. But land, whether in proving grounds or pastures, still has its conservation problems.

Tomorrow's conservation job will be tied into a high degree of planning and zoning by local government. This will be all to the good, not only for more orderly development or urban facilities but also as a hope of reducing the rate of loss of our lands best suited to agriculture. Soil and water data and the needs of conservation information we are gathering today will provide much of the base upon which such planning will be done. Agricultural planning will need to be closely correlated with urban and rural planning.

Role of Local Government

It is not difficult to predict that local government will play a much greater part in directing and financing conservation activities in the future. The trend is already apparent in soil conservation districts. Districts, of course, have always been subdivisions of state government. But it is only in fairly recent times that the States themselves, and the counties, have begun to realize the significance of that fact and have begun to assume greater responsibility for the support and administration of districts. About one-fourth of the total cost of operating the soil conservation program in districts—exclusive of what farmers pay to install practices—is already coming from non-federal sources.

If zoning and other forms of land-use planning are to be used extensively in the future, these functions can best be exercised by local government. This will mean work for trained soil conservationists, and will pose added problems for them, for they will have to adjust to community-wide or watershed-wide viewpoints. Technicians assisting soil conservation districts will need to be equipped to work effectively with urban groups as well as with farmers and ranchers.

As urban and community planning come more and more to the fore, there will need to be a means by which the soil conservationist and the urban planner can get together and work together. Here is possibly a new role for soil conservation districts within whose boundaries lies much of the land in question.

Another aspect of the changing rural scene is that our fast-growing population is demanding more outdoor recreation. This not only imposes special problems of land management but requires added attention to wildlife, woodland, and water development for recreational purposes. Whether recreation sites are maintained by government for free public use or are developed under private ownership for use on a fee basis, they require careful planning and management of a rather specialized nature.

This is only one of the many refinements of technical skills that are related to the increasing pressures of people upon land and water resources. Many of these developments that will affect land and the conservation job of the future are not agricultural.

New Problems in Agriculture

Agriculture of tomorrow, however, will have its share of new problems and continuing problems for the conservationist. Indeed, the increasing specialization we see taking place in agriculture today is already beginning to confront the technician with greater challenges than he has faced heretofore.

As we work toward maximum efficiency of production on our farm and ranch lands, soil conservationists are being called upon for more precise information about soils, water, and plants. The conservationist of tomorrow will not be able to rely on rule-of-thumb guides so much as in the past. Already we see some of our cherished generalities in soil conservation being replaced by more precise analysis and prescription for each situation. We have come to realize, for example, that legumes may not be necessary in every crop rotation, for in some instances it may be more efficient to supply nitrogen as fertilizer. In fact, rotations themselves are not necessarily good *per se*. Rather, each field needs a cropping system that fits that particular soil as a part of a continuing economic farm unit. We have made great progress in range conservation under the guidance of the rule-of-thumb of "take half and leave half," but our technicians and ranchers are learning to sharpen their standards of proper use to the different requirements of grass species and range sites.

Commercial farmers, and particularly those growing specialty crops, need even more exact information on moisture requirements of plants, the fertilizer needs of their soils, the quality of their water and irrigation and drainage techniques. Modern farmers are coming to know that efficient water use means that for each soil, plant nutrients and water must be brought into optimum balance. This requires the professional conservationist to deal with increasingly intricate problems of soil-moisture-plant relationships.

Figure 1. Alfred N. Moon, Sr. *(left)*, of Jackson County SCD, Newport, Arkansas, checks irrigation plans with Lyle Bobeck, SCS technician. During its first year of "flood" type of irrigation 60 acres of leveled land produced two bales of cotton per acre. Behind this field operation there is much research and the skills of engineers, water and crops experts, and equipment operators. The Work Unit Conservationist must know all operations and steps to bring a project to fruitful completion.

Figure 2. Drainage and storm damage is as important to airport management as it is to farmers. Runoff is 100 per cent on the concrete cover; the soil beneath has to be stabilized to support the load of airplanes. Soil and water experts share in the planning of landing fields.

Figure 3. Housing developments face problems of drainage and flooding. Advance surveys and planning with the aid of soil and water specialists help eliminate faulty construction and expensive corrections. Air field and housing developments will need more of the skills of conservationists.

To help us do this job, we shall need more research in all aspects of soil and water management, and then must get the research findings into practical operation more quickly.

Farming and ranching today is much more business-like than in the past years. Many farms and ranches are, in fact, operated as business enterprises, by business-trained managers. In some sections of the country, many farm or ranch operators live in towns or cities where they have interests in other businesses and participate in many kinds of organized activities. The trend toward larger commercial farms and vertical integration, to say nothing of better-educated farmers, is placing new demands on the conservation technician. These land managers expect and must have not only the highest caliber of technical assistance, but also conservationists who understand their problems in business management, in marketing, and in land economics in general.

Water A Dominant Factor

It is clear that water is rapidly becoming the dominant and limiting factor in agricultural development. This means that the conservation programs of the future will be directed more and more toward more efficient use of water, toward maximum storage of water, and toward development and protection of every possible source of water supply, for agricultural as well as for other uses. The U. S. Geological Survey estimates that by 1980 our total consumption of water will have reached 597 billion gallons per day—more than double the rate in 1955. I have read recently that more than 1,000 communities—the home towns of 15 per cent of our citizens—have had to ration water in the past five years.

Managing water on watersheds, in storage reservoirs, in ground aquifers, in canals, and *in* the soil as well as *on* the soil, must necessarily come in for greater attention. It will be necessary to base the management of crops, grass, and trees upon the availability and characteristics of water as well as upon soils and fertility, and on a broader base than erosion control alone.

We are moving in that direction, of course, but all our programs put together have only scratched the surface of total water development. Floods, which destroy life and property and waste water, must ultimately be brought fully under control by a system of water management that will begin at the uppermost point in the watershed, and utilize whatever device, at almost any cost, to keep water a servant of man all the way to the oceans. There is no question but that water problems will dominate much of the conservation planning of the future.

Regional Conservation Programs

Another prospect for conservation programs of the future is the possibility that they may be more directly tailored and adapted to the conditions and needs of a special problem area. Just as we today help farmers and ranchers adapt land use and treatment according to the needs and capabilities which soil surveys have delineated for each acre, we can perhaps do a better job for an entire region if the various types of assistance are more closely related to the overall soil, water, and climatic characteristics of the area.

We are attempting this now in the Great Plains program, where a special accelerated conservation program is relating technical aid, credit and cost-sharing to the particular needs of the region. And, in turn, an effort is being made to coordinate the soil and water conservation program more closely with economic and developmental programs designed to help stabilize agriculture and improve the economy throughout the Great Plains states.

Tomorrow's Opportunities

Tomorrow's conservation job includes a sizeable educational task that will continue to be at least partially the

responsibility of the professional conservationist. Notwithstanding the fact that soil and water conservation has generally favorable acceptance by the public, it cannot function properly without still wider understanding and support by all the people of the nation. And this includes the 87 per cent or more of our people who live in cities and towns and whose votes shape our public policy in conservation. These urban people must not be permitted to forget that under all is the land and that their existence, surrounded as it is by technological devices, is dependent upon a continuing base of natural resources. Thus conservation education—creation of a public conservation conscience—will continue to be a major responsibility of conservationists.

In that connection, I feel, conservation benefits cannot always be evaluated in terms of economics. It is true, of course, that we must justify much of our present-day activities in terms of monetary benefits. But there are some other values—some of which cannot be measured in dollars. I think we shall see growing appreciation of these other contributions of conservation to better living.

So much for the shape of the conservation job tomorrow. Many of the implications for conservationists become immediately apparent as we sketch the picture. While the view ahead sets up more rigid demands it also holds some new and greater opportunities for professional conservationists.

* * *

It is my firm conviction that the conservationist of tomorrow will enjoy a better recognized position in our organizational and professional structure. His employment opportunities will be broader as more levels of government and more segments of society find it necessary and desirable to employ conservationists. The trend toward employment of conservation specialists in industry and business, in education, and in state and local government is only beginning, in my opinion. And as the importance of this function begins to be recognized, remuneration for such work is improving.

Trained conservationists will have opportunities to work in a greater variety of applications of conservation in the future. For example, I am sure there will be a tremendous area of opportunity for men and women with conservation training in the field of municipal, county, and regional planning. They will be sought in increasing numbers by state and county government, municipalities, and private industry for water programs. Banks and other financial institutions are employing experts in soil and water management. The legal profession, especially as water rights become of high concern throughout the country, is seeking conservation-trained consultants. Large commercial farms and ranches are hiring conservation technicians. Soil and water conservationists are playing a larger role each year in curriculum planning in the school systems, in planning and developing recreation sites, and in assisting with conservation education for youth organizations.

Yes, the field of opportunity in soil and water is broadening rapidly.

The question is whether we are moving in the right direction and quickly enough to provide the numbers and quality of professional conservationists that will be needed in the future.

Our land grant colleges and other training institutions are not unaware of the demand. Nearly every school now offers, in one form or another, courses or a curriculum in conservation. But they want and need more guidance from professional conservation organizations such as our own. They want and need, also, support from such organizations as ours for some of the fundamental educational improvements for which they already recognize the need.

I believe most of us are in agreement that to be properly equipped to do tomorrow's conservation job, the conservationist needs to be better trained both in *depth* and *breadth*.

By that I mean that he not only needs to be more acute in the special scientific skills that soil and water conservation require, but he also needs a better understanding of other related subject matter areas. And he needs to know a great deal about how these areas are related and what the relationship means. If, as I predicted, conservation tomorrow involves many more facets of physical and human problems than at present, tomorrow's conservationist must have more than a speaking acquaintance with a wide range of subject matter. Conservation assistance of the future must meet the needs of *all* the people, not just the agricultural part of our society.

To achieve this goal of broader yet better trained conservationists we will have to take action of several kinds, I believe.

First of all, I question whether tomorrow's conservationist can achieve the broader technical education he needs unless his general, pre-professional education is fuller. Let's look, for example, at a conservation technician of tomorrow—if not today—who is helping a community plan its watershed project. Don't you agree that he may quickly find use for a respectable amount of training in social, economic, and legal aspects of land and water use, as well as in—say—hydrology? He may need more background than today's average technician to be able to understand and work effectively with the city, county, and regional planners who are coming into the picture in rapidly growing numbers.

Some of this, certainly, depends on a better underpinning in the elementary and secondary schools or upon a lengthened period of undergraduate work in college. This

may be outside the scope of our discussion here. Yet I feel we should call this need to the attention of educators, many of whom I'm sure agree but have not been able to obtain support for fundamental improvements in the curricula of lower level schools.

In shaping the training schedule for tomorrow's conservationists we must not overlook emphasis on leadership training and communication. The best technicians sometimes make the poorest administrators, and without good administration, the work of the best technicians may go for naught.

Conservation agencies and organizations bear a further responsibility to continue the conservationist's training on the job. The science and art of land use are far from static. One of the ways we can insure that conservation workers are keeping up to date is to provide opportunities for and require participation in on-job and refresher training. A significant step in this direction is the law passed by the last Congress to make it possible for federal employees to take time out for advanced training at government expense—a device long used by industry to keep its key people abreast of new techniques and new knowledge.

Self-Improvement is Paramount

Finally, whether or not the conservationist successfully equips himself to do the kind of a job required in the future will depend in the main on his own attitude and initiative for self-improvement. One of our greatest opportunities, as a *Society*, is to hold before conservationists, young and old, the inspiration of intellectual curiosity, and the satisfaction of gaining new knowledge. However many adjustments and new opportunities we may obtain in the educational field, none will serve to educate a man unless he wants to grow in knowledge and skill. I hope the *Soil Conservation Society* will continue to direct a major part of its energy toward the goal of encouraging this growth, now and in the future. It is, in fact, an immediate need, because I fear that many working conservationists today are not keeping up as they should. In the Soil Conservation Service, we watch for participation in professional activities—attendance at professional meetings, writing for technical and professional journals, membership in this and other technical societies—as a mark of an employee's determination to make the greatest possible contribution to his profession and, therefore, as a measure of his potential for advancement.

A Challenge to the Society

In closing, I wonder if we fully appreciate what the papers and discussions of the past three days here represent. If, as we believe, the future well-being of our country rests heavily upon how well we manage our natural resources—especially our soil, water, and plant and animal resources—then the opinions and conclusions that have been voiced here are urgently needed by those in our Nation who have planning responsibility in agriculture, education, industry, and government. I hope that an appropriate committee of this *Society* will make a study of the observations and recommendations we have heard here and make positive suggestions to such leaders. As conservationists, our concern for the shape of tomorrow's living must not be lost in our preoccupation with today's problems. And, as I said before, "today" becomes "tomorrow" before we know it.

Figure 4. Work on agricultural lands to prevent erosion, use water efficiently, and build up soil fertility will continue to be a primary task of soil and water conservationists of tomorrow. Here in Calleguas SCD of Ventura County, California, discussing various aspects of a contour layout for lemons, are *(L to R)* ranch superintendent Les Taylor, WUC Robert Rust, and accountant Grant Peel.

Chemical Control of Evaporation in Australia

A. L. TISDALL

THE NEED FOR CONTROLLING EVAPORATION: Australia is the driest of all continents, with a big area, about a fifth of the total, which has no rivers, and a comparable area where the rivers are intermittent. Only a fringe near the coast in the north and east, with comparatively small areas in the southeast and southwest, have an annual rainfall of over 40 inches.

The area of Australia is roughly the same as that of that U.S.A., but the average annual rainfall over the whole Australian continent is 17 inches, compared with 29 inches for the United States. This difference is much more striking than it first appears, because the proportion of the rainfall that runs off the land and can be stored for later use is smaller when the rainfall is low. In Australia, not only is the rainfall low, it is also very variable and evaporation is high, particularly inland from the coast.

As would be expected in such a climate, a great deal of attention has been paid to water conservation, and consequently there has been considerable interest in ways and means of reducing evaporation from dams and storages.

The Commonwealth Scientific and Industrial Research Organization (C.S.I.R.O.), in common with many agencies throughout the world, has been searching for a substance which will form a film over a water surface, and so reduce evaporation. The film must be capable of spreading over the water surface, and must not react with "hardness" chemicals in the water to form a solid layer. Solid layers are quickly fractured by wave action and lose their ability to reduce evaporation.

The material must be stable, and not easily oxidized or attacked by bacterial action. Finally, it must be capable of being applied and maintained on a water surface under practical conditions.

Research during the last 30 years has shown that monomolecular layers of long chain polar compounds placed on water surfaces have the desired effect on evaporation. A monomolecular layer consists of a stratum, one molecule thick, that is formed by long molecules aligning themselves side by side, with one end in the water and one end out, much as upright matches in a matchbook. The *hydrophyllic*, or water-loving end, of the molecule is in the water, while the water-fearing, *hydrophobic*, end protrudes.

The chemical which fulfills these conditions best so far is *hexadecanol*, a long chain saturated alcohol. Its use was reported by Mansfield (1953) and has since been widely tested.

Its ability to form a film on water is illustrated in the photographs in Figure 1.

Field Experiments

The development of suitable equipment and techniques for hexadecanol application has been proceeding in Australia (Mansfield 1955, 1956, 1957), in U.S.A. (Beadle and Cruse, 1957, Florey 1958), and in India (Ramdas 1958).

A great deal of investigational work has been done in the field in Australia where a number of authorities have cooperated with C.S.I.R.O. in working out these techniques. The work carried out in cooperation with the State Rivers and Water Supply Commission at Ouyen in the northwest of the state of Victoria is typical. In earlier initial experiments in this region, it was found difficult to separate water losses and determine the proportions accountable to seepage and to evaporation.

The town of Ouyen has an annual rainfall of less than 12 inches, and depends on water from local earthen storages filled annually by a domestic-and-stock channel system. The town needed an additional water storage, and the commission suggested that the first stage of the proposed excavation for this could be utilized as an experimental storage.

The specification called for a water-tight storage 600 feet long by 75 feet wide and 6 feet deep, with 3 to 1 side slopes except for one sloping end having a gradient of 1 in 25, the length of the excavation to be located in the direction of the prevailing wind so that normal evaporation would be at a maximum.

On completion of the excavation, an agricultural tile drain was laid down the center of the storage, and the bed of the storage sloped to this drain, so that any seepage water could be collected in a pit at one end, and measured.

A polythene sheet, 0.004 inch in thickness, was laid on a carefully prepared subgrade of sand. The sheet was supplied by the manufacturers in two pieces, 600 feet long by 60 feet wide, and welded in situ, giving a longitudinal joint down the center of the storage. The whole area was treated chemically to kill any yabbies, small fresh-water cray-fish, which would otherwise have damaged the polythene sheet. Figures 2 and 3 show construction in progress. The commission then handed over the storage to C.S.I.R.O. to run the field tests.

A. L. Tisdall is Commissioner, State Rivers and Water Supply Commission, Victoria, Australia. This paper was prepared on invitation for the JOURNAL.

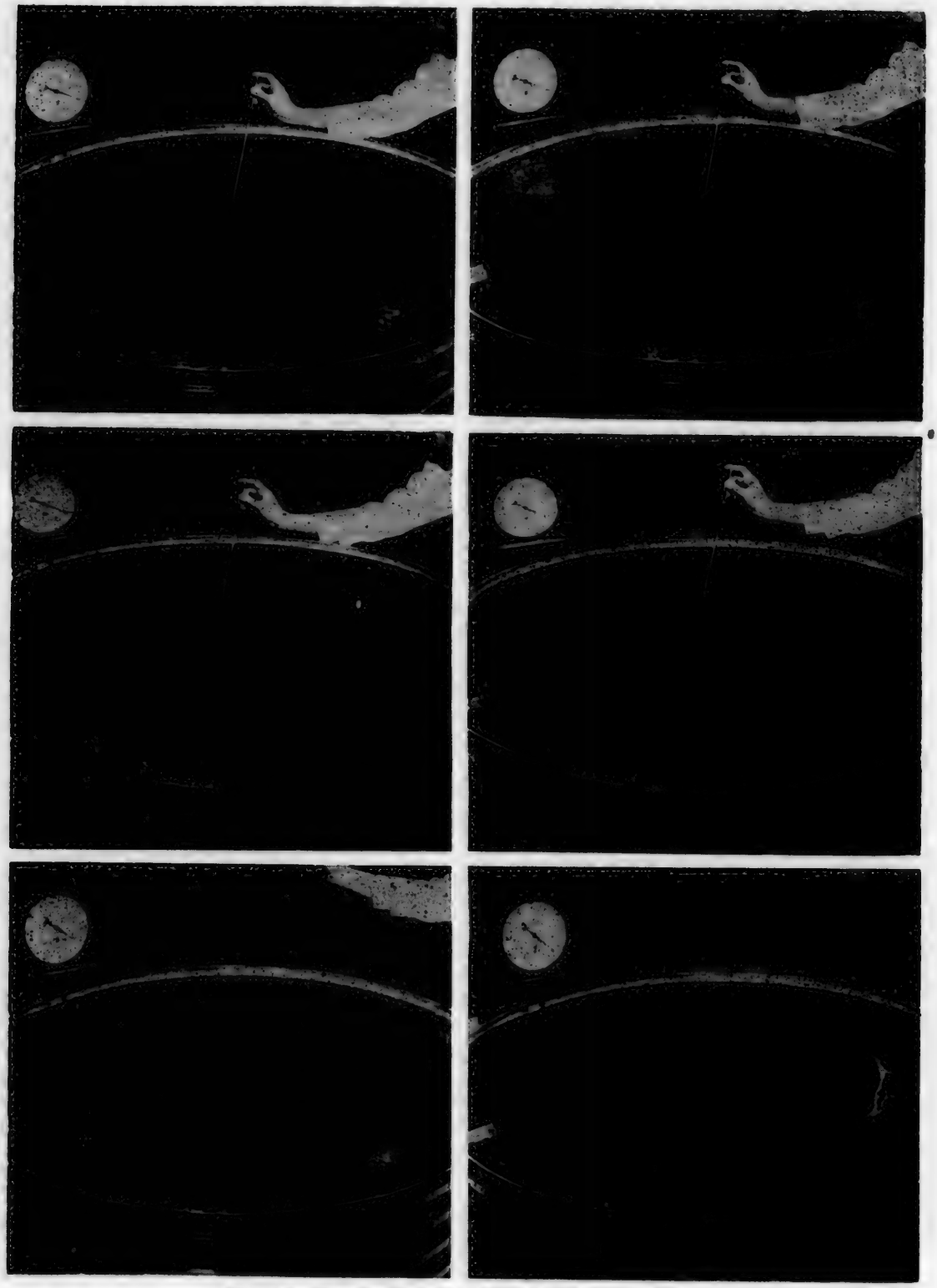


Figure 1. The spreading of a film of hexadecanol shown by an expanding ring of talc particles swept from the surface.

Figure 2. Water storage excavation at Ouyen was utilized to measure evaporation. Seepage loss was eliminated by lining the bottom with a polythene sheet. Here is the laying in progress, the outside edge being buried in the trench and the inner edge being secured under lengths of timber as the membrane unwraps concertina fashion from the mat.

Figure 3. The second strip of lining, 600 feet by 60 feet, being laid parallel to the first. The two strips were then heat welded together down the center of the reservoir. To collect and measure any water that might seep through, an agricultural tile drain was laid down the center of the storage and sloped to a collection pit at one end.

Appropriate meteorological instruments, such as rain gauges, evaporimeters and wind recorders were installed at the site. Thus not only were the seepage losses reduced to a minimum and measured, but the expected evaporation losses were recorded. The reduction in evaporation due to hexadecanol treatment could thus be assessed.

It is on the results of field tests such as this that the recommendations made by C.S.I.R.O. are based; these recommendations cover both the chemical itself and the method of application.

The Chemical and Application

Hexadecanol is a white, waxy solid which floats on water. It is used for a wide variety of purposes and is usually marketed in commercial grade under the name cetyl alcohol.

Ludzeck and Ettinger (1957) report considerable biological oxidation of the hexadecanol in U. S. A., but this has not been a problem in Australia, possibly because it has been used mainly in areas of sparse population.

Oxygen transfer is not seriously reduced by the monolayer. Linton and Sutherland (1958) report that it appears safe to add a hexadecanol film to any water reservoir which is initially 90 per cent saturated with oxygen, as the effect of the film would certainly not lower the oxygen content below the satisfactory limit of 80 per cent.

To be effective the hexadecanol must conform to certain standards, which are outlined in C.S.I.R.O. Leaflet No. 15 (1958).

The organization is prepared to endorse material with certification mark SI-RO-SEAL if it fulfills the following specification:

The hexadecanol shall be in the form of beads the diameter of which lies between 2 mm. (0.08 in.) and 4 mm. (0.16 in.) the preferred size being between 2.5 and 3.0 mm. (approximately one-tenth and one-eighth of an inch).

The sample shall contain:

Hexadecanol	Not less than 80 per cent
Octadecanol	Not more than 10 per cent
Tetradecanol and dodecanol	Not more than 5 per cent together
Alchols of chain length less than 10	Not more than 0.5 per cent
Unsaturated alcohols	Not more than 4 per cent

The sample shall have the following properties:

Iodine value	Less than 3
Acid value	Less than 0.3
Saponification value	Less than 0.5
Hydroxyl value	225 to 230
Melting point	47° to 50° C.

The thin film of hexadecanol slowly disappears from the water surface but is replenished from beads stored in a raft.

On dams of up to about one acre in area one raft should be used; dams between one and two acres in area need two rafts.

The beads are confined within a gauze basket which prevents them from dispersing but does not interfere with film formation. Suitable floats keep this basket on the surface of the water. The floats and the basket can take many forms. Two satisfactory commercial units are illustrated in Figures 4 and 5.

The Basket

The gauze basket should enclose an area of water surface of 9 square feet. A charge of 2 to 2½ pounds of SI-RO-SEAL hexadecanol is placed in the basket and this should completely cover the water surface enclosed by the basket. At about monthly intervals more SI-RO-SEAL hexadecanol should be added to maintain the complete layer of beads—the quantity required will vary but will probably be about ½ to 1 pound for each raft.

The basket enclosing the hexadecanol need not be made wholly of gauze. The important requirement is for most of that part of the basket which is at water level to be of gauze. This section, which can be referred to as the window, should be at least 3 inches high and be centered on the water level. The combined total length of the window section should be at least 6 feet. The remainder of the basket can be of metal, plastic, or other similar material which will prevent the escape of the beads.

The gauze should be of bronze and of 14 to 16 meshes per inch. Zincoid fly-wire has been tested but it rusts rapidly and is therefore unsatisfactory while aluminium gauze has caused trouble with clogging. It is possible that a gauze of light-resistant plastic will be a satisfactory substitute for bronze, but it has not yet been tested. Close inspection is needed to ensure that there is no hole

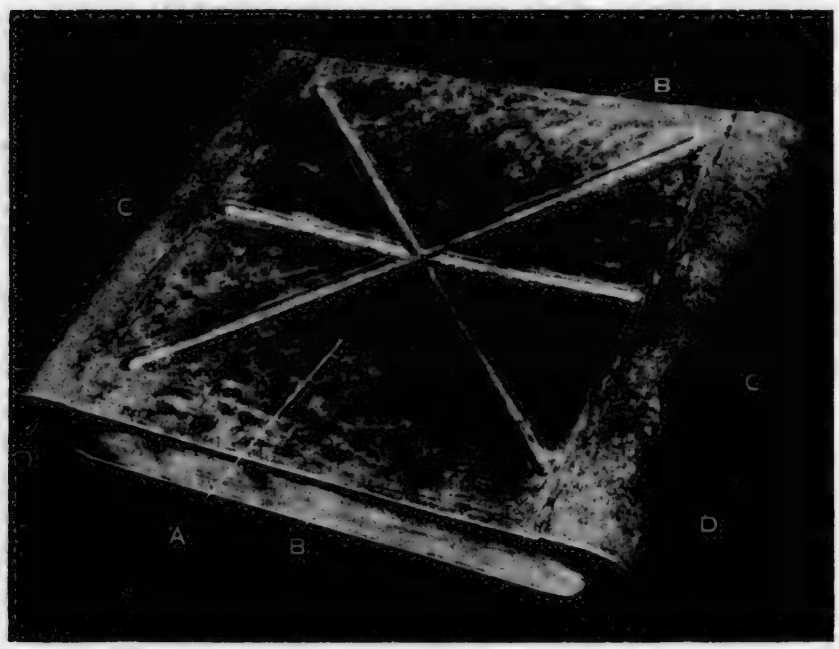


Figure 4. In the Mansfield process a commercial raft of fiber glass and plastic can be used. The top and bottom of the container are of fiber and plastic which are impermeable to water. No adjustment should be necessary for positioning of floating. *A*—filling plug; *B*—gauze windows; *C*—anchor bolts; *D*—cylindrical float chambers.

Figure 5. A commercial raft of gauze and wood (courtesy of Fairey Aviation Company of Australasia). The top and bottom of the container are of gauze with supporting wooden members to give strength. The freeboard of the raft is adjusted by adding or removing water from the plastic cans. *A*—filling trapdoor; *B*—gauze windows; *C*—anchor bolts; *D*—plastic floats.

anywhere in the gauze from which the beads might escape; otherwise the whole charge will be lost as the raft is tossed about by wavelets.

The basket should be provided with a suitable opening to allow it to be charged with hexadecanol.

The Floats

One commercial raft illustrated is made of glass fibre reinforced plastic. The basket has plastic top and bottom plates; two of its sides are completed by the two cylindrical float chambers, the other two being made up of aluminium gauze windows.

The second commercial raft illustrated has a basket with a wooden frame covered with bronze gauze. Four plastic cans act as floats.

The top of the basket must float at least 3 inches above the surface of the water and the bottom of the basket at least 2 inches below the surface of the water. If the raft sinks low into the water, even if it is still floating, the waves will rub the beads against the top of the basket and within a short time they will disintegrate into small particles which will escape and be lost.

Rafts relying entirely on the buoyancy of wood have proved to be unsatisfactory. Whatever treatment is given to the wood it becomes water-logged and the raft sinks lower into the water, permitting abrasion of the beads against the top of the basket.

The raft can be kept in the center of a dam or tank by means of two wires stretched from the shore and attached to opposite sides of the raft. This arrangement makes it easy to pull the raft to the shore for monthly inspections. Alternatively, the raft can be anchored in the dam or tank.

After being loaded with beads the raft should be floated and the height of the basket adjusted, if necessary, so that it is 3 inches above the water surface. Each month a check should be made to ensure that there is enough hexadecanol to cover the water surface inside the basket and that the top of the basket is still about 3 inches above the surface of the water.

Results and Future

Much of the water stored in unlined dams is lost by seepage and evaporation. Measurements of losses in various parts of Australia have shown that the seepage losses vary from one-half to three times the evaporation loss. Furthermore, the rate of seepage changes with variation in the rainfall.

Treatment of dams with cetyl alcohol is known in Australia as the Mansfield process, and is now well established, the equipment being available commercially. Theoretically, there is no reason why the saving in evaporation should not be in the region of 55 per cent, but in practice the figure is about 25 per cent.

The process has so far been recommended only on areas of water up to two acres, on which waves are small. On larger storages wave action becomes a major factor, and the raft method described becomes uneconomic. Recent research has indicated that a satisfactory film can be maintained on medium-sized storages by feeding a solution of cetyl alcohol in a solvent onto the water surface. Using this new method, a satisfactory film was maintained for over three months on a storage of 930 acres at Broken Hill, in the far west of the State of New South Wales. A saving of about 1-foot depth of water was achieved.

This still does not solve the problem of much larger storages used for irrigation, but the progress made so far has been very encouraging. It seems that it will only be a matter of time before an effective technique has been developed for large expanses of water.

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Soil Conservation in Israel

N. GIL

AN AERIAL VIEW of the Land of Israel reveals a broken, uneven topography, scarred by centuries of winds and fires which scorched vegetation; and erosion from winter rains and floods which swept away mountains and hills and destroyed the soil. In the South of Israel lies the Negev desert, whose winds raise clouds of dust from the bare hills, and sudden floods wash away the little arable land left by the wind. The stream beds are then filled with flood waters, and flow into the sea with no benefit to the land; everything returns to its former wasteful state.

* * *

These processes and their results are known to the Israel farmers, who are learning methods to prevent them through a science new to them: soil conservation, which will be one of the major topics of discussion at the International Farmers Convention to be held in Israel next spring. Dr. W. C. Lowdermilk, who introduced this science to Israel, will address the convention on this subject. During the Farmers Convention, participants from all over the world will be guests of Israel farmers on settlements of all types, and will study the agricultural life and soil development throughout the country.

Recognition of the need for soil conservation in Israel is growing hand in hand with the expansion of irrigated areas, and the intensification of all branches of agriculture. Due to Israel's limited area and ever-growing food needs, every acre possible should be brought under cultivation and today every attempt is being made to exploit the land to its full productivity.

Much of the land which is already under cultivation is still faced with the threat of active erosion which washes away the soil and endangers the very existence of the farmer.

On the loess covered plains, in the hills and foothills, every rain enlarges the degree of sheet erosion, reducing productivity and yields.

Nathan Gil is director, Soil Conservation Division of the Israel Ministry of Agriculture, Tel-Aviv, Israel.

The International Farmers Convention he mentions will be held in Israel March 16 through May 17, with three Symposia, field tours and a general convention attended by farmers from more than 25 countries. For program details write P.O.B. 184, Jerusalem.

In the mountains, toward the east and north, the topography of the land rises. In Biblical times, these areas were covered with deep and fertile soil, richly vegetated, and the slopes were terraced for plantations and field crops. Large areas were under forestation and others used for grazing. Today, only traces of this agricultural life remain: low thorny bushes and gray rocks cover the land.

Since most of the hillside lands are not suitable for cultivation due to their shallow soils, slope and stoniness, the idea was proposed to ameliorate these lands for use as natural pasture. The thorough survey of the vegetation and physical factors which was made recently revealed that after proper reclamation and improvement, it is possible to raise about 100,000 head of cattle annually for the nation's food supply.

In the alluvial plain and inner valleys, flood waters which came down from the hills have deposited a deep and fertile soil. However, the narrow stream beds cannot carry the flood waters which pour into them after heavy rains, and large areas are flooded.

The sand dunes, which start in the South and extend to the Valley of Acre, are steadily moving inward from the sea. In the process, they block off natural stream bed outlets to the sea. These sea winds have continued for centuries to blow the sands inward, on to the cultivated interior.

Fire is another but not least destructive threat to the development of Israel's soil. Every year this element destroys plantations and groves, forests and pastures, and the ensuing rains wash away the soil from the stricken slopes.

After centuries of neglect of the land, the State of Israel was established in 1948, and it became apparent to the agricultural authorities of the new state how little knowledge there was of the ancient soil and its potentialities. Questions and doubts were many! What land could be cultivated for irrigated crops and what for non-irrigated crops? Which land was most suited for plantations and which for afforestation and grazing? What production potential could be hoped for? A national soil survey was made by the Israel Soil Conservation Division, and a soil map was made, showing the different kinds of soil and the land use. A need was felt to fit the types of planning and accomplishment of soil conservation methods to the climatic, soil and specific economic conditions which exist in Israel.

Even the basic data were lacking. The rainfall intensity in different regions of the country was unknown, as

Figure 1. These terraces on a slope of about 20 per cent will protect some new vineyards.

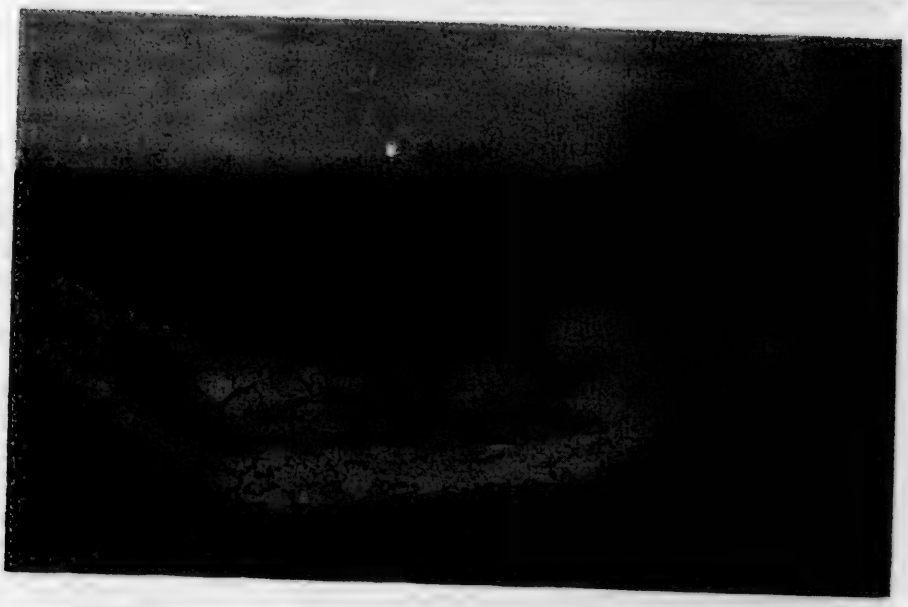

Figure 2. Torrential rains can damage poorly constructed drainage ditches. Stone drop structures at proper intervals aid in designing the ditches so that water is slowed up and its scouring and cutting power reduced.

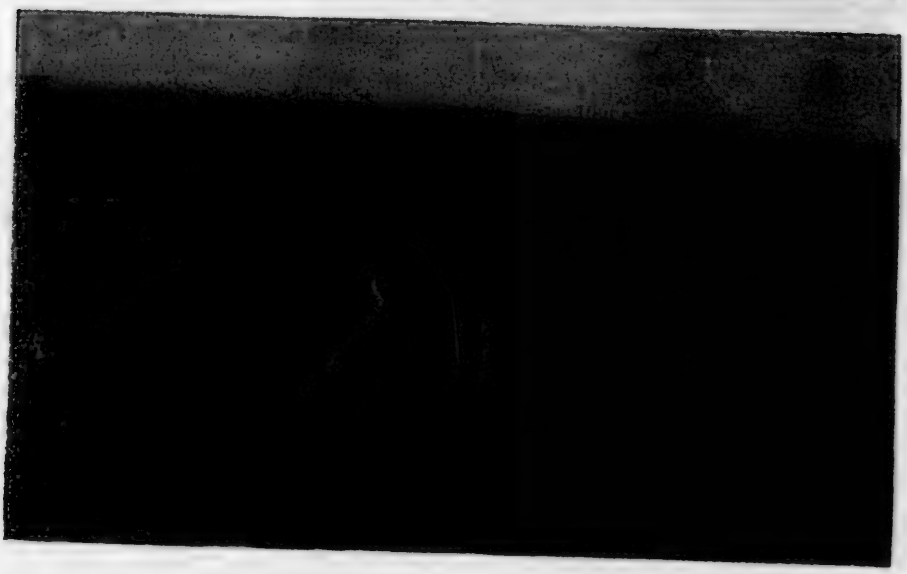

Figure 3. Contour cultivation and irrigation combined aid in stabilizing slopes, saving soil fertility and using water when needed.

well as the degree of its infiltration and runoff, creating erosion. What was the resistance force of the soil to flowing water, and the sensitivity of these various soils to erosion and leaching.

In the Soil Erosion Experimental Station, various types of research are now in operation, with the aid of new equipment to create artificial storms. This enables us to learn the influence of rainfall intensity on soil erosion and the amount of runoff, and the results of this experimentation have already influenced the plantation and irrigated fields.

Research into runoff from typical areas is being conducted, in order to enable planning for flood prevention.

In mobilizing all our forces in the battle against soil erosion, soil surveys were made to determine land use and planning for the prevention of this type of soil destruction. Laws were passed which obligate the cultivation of the land on the contour. In more erosive lands, broad-based terraces and diversion ditches were constructed. Gulleys were transformed into grassed waterways. In the deep gullies, rock drop structures were built to reduce soil erosion. A program of strip cultivation was introduced and gradually the farmer recognized that it was beneficial to cultivate land only according to the principles of soil conservation.

Today surface drainage is improved by use of grassed waterways on the slopes and drainage ditches in the plains. Subsoilers were introduced to break up the hardpan that prevented internal drainage, and a system is being used of surface irrigation in level borders.

Swampy areas which suffered from a high water table were drained and the undesirable vegetation eradicated. Israel's major swamp clearing project took place in the past few years, in the North. The drainage of the Hula Swamp cleared 15,000 acres for rice, cotton and industrial crops.

Figure 4. The lands of Israel have been subjected to severe treatment for centuries. There is still evidence of soil wash to be seen, but advancement made in restoring the lands to high productivity has been laid on a careful foundation of research and surveys, skilled and dedicated technicians, and the will of the people.

Other major steps were made towards the development of Israel's soil, and systems of planning were developed that were suitable to the special conditions of the mountain area. Experiments were made with the use of special equipment for permissible slopes in terraces.

In 1951, a program began of soil improvement and the planning of grazing in hillside areas. Undesirable shrubs and forbs were destroyed and replaced by good native grasses. Fire lines were made to prevent fires from spreading. Areas were fenced off with barbed wire, and approach paths to pastures were constructed, with watering facilities, sheds and paddocks.

The improved natural pasture was divided among the settlements, under condition of proper use. In order to supply the necessary seeds, a grass-seed nursery was set up.

The State enforced a fire prevention law and organized groups of fire fighters, with proper equipment. Fire lines were ploughed in the fields, and courses were given to teach fire fighting and prevention. The number of fires and damages is on a marked downward grade.

Tremendous efforts are being geared to stabilize the sand dunes and to use them for range and carob trees [evergreen with edible pods, used as fodder]. Windbreaks and strips of stabilizing grasses were planted; the surprising results teach us that under certain conditions it is possible to level the dunes and create arable land by the action of the wind. In the Station for Sand Dune Research, good stabilizing grasses for dunes have been found. Further research is being conducted into plant types which not only stabilize the sand, but are also good for grazing and industrial purposes.

The Department of Soil Conservation is focusing a major effort on the exploitation of the flood waters of the Negev for agricultural use. In Sde Boker (a collective settlement) in the Negev, and in other farms in the region, areas are being irrigated by storm-water flow only. These flood waters are diverted to the fields by means of dams and ditches, and alfalfa, orchards and grasses have been successfully grown there.

* * *

The soil and water conservation problems of Israel are many, but the beginnings of solution are promising. Israel's soil conservation balance sheet shows a tendency to the full and proper use of her soils—from the northern fertile valleys to the sand-blown desert wastes in the south, which will open new horizons in the agriculture of this new land.

Planning for Watershed Management

C. R. HUMPHRYS

PLANNING is little more than an intelligent look into the future. The procedure varies from temporary mental images created by thought processes to thick monographs of data and the conclusions based on statistical averages and trends. The concept of planning is not new, for all sane people must plan if they are to survive.

A watershed is a natural unit of land. We have been told that it is an area of land drained by a stream or a river. The term "watershed" may be used to describe the extensive area of land drained by the Mississippi River or a slight depression in the back forty that is drained by an intermittent stream.

Currently, the public accepts the idea of a watershed as a small area of land. It might vary in size from a very few hundred acres to 200,000 acres but not large enough to accommodate the Ohio, the Colorado or other major river systems.

In either instance, the boundaries are arbitrary, for we do not know enough about any watershed to traverse it with a transit and not have a few reservations about our accuracy.

The dimensions involved in a true description of a watershed are not limited to the simple areal concept of surface measurement. In addition to length and width, we must consider depth for all of us realize that ground water is merely a hidden segment of the hydrologic cycle. The character of the soil and the nature of the geologic formations must be appraised if the water regimen of any watershed is to be analyzed. Geologists have long ago recognized that precipitation falling in one watershed may actually become the stream flow of an adjacent watershed—via underground movement. The only direction left is up—and although it might appear unreasonable at first, we have gained considerable respect for the effect of vegetation, climate, exposure, topography and geographic location as factors that limit the amount of water flowing out of a watershed. We are not even shocked to learn that some of our watersheds may actually use more water than they receive from precipitation. The only dimension left is one that is frequently overlooked—*time*. As a natural entity, a watershed ages with time—its changes may be small but not too insignificant for our planner to recognize. The most obvious changes involve the character and location of the stream itself, which shows its age by sometimes threatening or destroying the use of land. Cultural changes literally take place overnight as our social needs change and expand.

C. R. Humphrys is associate professor, Department of Resource Development, Michigan State University, East Lansing. *This paper was read before the South East Michigan Regional Meeting of the Soil Conservation Society of America, October 25, 1957, at Ann Arbor, Michigan.*

The small watershed is an ideal vehicle for the planner to use in his work. The natural characteristics—*soil, vegetative cover, geological strata, climate*—are most likely to possess a high degree of consistency or uniformity within a small watershed. The cultural characteristics —*land use, land ownership, population density and character, law, problems*—will be more and more uniform as the size of the watershed decreases.

The less variables present—natural or cultural—the more easily it is to plan.

Tools for Planning

In order to make a plan for a watershed, certain facts are needed. These involve precipitation, stream flow, land use and all the other natural and cultural characteristics of the watershed. Man has developed an insatiable appetite for facts; however, it is seldom expedient to secure all the facts that might be available. Under practical conditions, the planner must work with an assortment of selected facts. One decision we must make today concerns just how many facts we can make available for watershed planning. If all the facts were available, planning would be a simple task. As we make decisions to plan with only representative selections of facts, the task becomes more difficult and accuracy may become questionable.

In the fields of natural science and engineering, we have developed effective techniques for watershed management. The facts available may not be complete, but they could suffice.

Our great weakness in watershed management involves the social sciences—law, economics, politics, and other institutional factors. As a matter of practice, one learns that people must be considered as factors or resources in watershed management. The popular approach of watershed management (under Public Law 566 and amendments) requires that local people recognize, survey and even help finance plans for their watershed problems. The term "grassroots planning" is sometimes used to describe this method of planning. The theory is simple; however,

the process seldom occurs voluntarily in our society. The "grassroots" frequently need fertilizer, and sometimes drastic tillage is required to stimulate the *upward movement of planning*.

Questions for the Watershed Planner

1. Today's number one question involves the "price tag" of the "plans." It seems that as the price increases, the interest in watershed management decreases. The economist will say that our ultimate goal is the "maximization of benefits." Unfortunately the planner must decide who will use these benefits and who will pay for them.

2. Plans are never made and set in motion until the problem becomes almost unbearable. Few of us use a doctor to stay well.

3. The effects, good and bad, of many proposed watershed management programs extend far outside of the local watershed. We will need someone to watch over and correlate the efforts of individual watersheds.

4. In the assessment of costs and benefits, there seems little chance that the intangible factors will gain the true recognition that they deserve. Here lies a frontier that few pioneers dare approach. The Lake States have many recreational values that are classified as intangibles. These intangible values do not lend themselves to the usual engineering analysis, however they should not be disregarded because of ignorance concerning their real value.

5. Plans should never be accepted as the final solution. A watershed is highly dynamic and it follows that a plan for a watershed should also be dynamic.

6. Flood-plain zoning is frequently looked upon as a possible solution for problem watersheds. Unfortunately, this theory is based upon the premise that the zoning should precede the use. In a problem watershed, the land-use patterns are well established. Few planners find it expedient to recommend that all use be removed and thereafter limit the use in accordance with rigid regulations.

7. There is ample evidence that local watersheds not only invite Federal participation but also campaign for maximum Federal aid. This might be recognized as a shift toward socialism and should be carefully examined.

8. There is little precedent available to guide us in using a combination of direct and indirect benefits to arrive at an equitable assessment of cost.

9. In Eastern United States, we will find that many watershed management programs will be restricted by the legal interpretation of the Riparian Doctrine. Consumptive uses and pollution are notoriously castigated and declared non-compatible with the traditional water uses of domestic water supply, recreation and power. If we change our Riparian Doctrine we must accept the fact that water represents property and may not be promiscuously taken and merely allocated to an assumed higher use without benefit of due process and equitable reimbursement.

10. Multiple use as a concept has almost magical qualities. Everybody accepts it as being highly desirable and look to the planners to fabricate this "El Dorado" of conservation. Multiple use is obtained only by "developing" a resource so that it serves many masters. The masters must realize that the "development" requires capital or a combination of other resources. A desirable balance of multiple use cannot be developed or maintained with blueprints or documents alone. We must accept the bitter fact that additional benefits may be squeezed from a resource only by the coordinated application of increments of capital or labor.

A New Philosophy May Be Needed

The more intelligent the people in a watershed the more difficult it appears to get representative agreement.

Theoretically, planning should be highly centralized and administered by professional experts. This is diametrically opposed to the popular democratic procedure of grassroots planning.

Truth is not always easy to recognize or evaluate. It has even been suggested that we need new categories established for "half truths" and "quarter truths" when collecting data for watershed management.

Is it possible to expect that land owners might invest in watershed management practices that will not only serve them but also contribute to future benefits for society? Sometimes we accept the bill for improvements that give immediate gains but we are quick to let "the government" take the burden for long-term and indirect benefits.

Watershed management is quite complicated. Possibly there should be various phases recognized with experts assigned for each phase. The survey and compilation of facts require not only a high degree of professional knowledge but also sufficient experience to evaluate the potential components. Good planning can usually be expected only from professional planners. Thereafter the needs probably all fall in the broad category of promotion. It is the implementation or "selling" of the program that usually fails. Most frequently the failure is attributed to reliance upon the spontaneous voluntary acceptance rather than a practical job of salesmanship.

FIELD NOTE BRIEFS

A CONSERVATION WEEK

Each year certain weeks are designated for some particular phase of conservation. One week that has been well-organized and effective across the broad front of conservation is *National Wildlife Week*, sponsored by the National Wildlife Federation and its state affiliates. This year, *National Wildlife Week* will be held March 15-21 with conservation in the schools—**"The Three R's and Resources**—the major theme. Some excellent materials have been prepared and can be obtained by *SCSA* chapters for examination and use by writing the National Wildlife Federation, 232 Carroll Street, N. W., Washington 12, D. C. (In writing mention the JOURNAL OF SOIL AND WATER CONSERVATION.)

A number of suggestions are listed on how to promote this conservation week. The procedure in general affords a valuable outline for any group that may wish to participate not only in this particular week, but in other weeks devoted to conservation aspects—for example, Soil Stewardship Week.

1. Arrange conservation programs for school assemblies. Plans class tours of a nearby game range, wildlife refuge, farm or forest management area. Ask leaders of private conservation organizations and the personnel of wildlife and conservation agencies to participate in these. Similar tours should be scheduled also for adult groups—service clubs, fraternal organizations, etc.

2. Plan conservation meetings with speakers, slides, or movies to demonstrate conservation needs of your community. Show how these can be met by teaching conservation to the future users of the lands in your public schools.

3. Sponsor window displays and exhibits to illustrate conservation projects that can be carried out by school and youth groups; natural food and cover plantings for wildlife; school ground beautification programs; soil erosion control measures—seeding of ground cover plants, terracing, check dams, streamside plantings and gully stabilization in small watersheds; forest plantings and improvements; small dams and other fish habitat projects in streams and ponds; classroom experiments to demonstrate conservation principles; mounted wildlife specimens, scrapbooks, etc.

4. Schedule radio and television interviews and commentary. Use slides, films, photographs, tape recordings.

5. Secure news and editorial comment in local newspapers. Submit photographs.

6. Sponsor and maintain conservation corners in your school and public libraries where conservation materials of interest to young people, teachers, and conservation-minded adults can be collected in attractive assortments.

7. Organize local and statewide committees to provide conservation programs in your public schools, colleges and universities. Such groups can encourage educational institutions to include conservation training in the professional and vocational programs of every student.

NEW MEXICO GRANT

The University of New Mexico, Albuquerque, has received a grant of $100,000 for public education in problems related to New Mexico's water and watersheds. The Charles Lathrop Pack Foundation of Washington, D. C., in making the grant stated that the money is slated for a three-year program and will include developing a series of TV programs; production of a color motion picture in sound; a community evening course; and preparation of study guides for educational groups and schools.

George Worley of Iowa State Teachers College and an SCSA member will be in charge of the program. He expects to be in residence in Albuquerque early in January.

Other phases of the program will include establishment of a University summer workshop in water and watershed conservation, preparation of a traveling exhibit, and establishment of conferences of teachers, county agents and conservationists.

FELLOWSHIPS AVAILABLE

A number of graduate research fellowships are available at Michigan State University for Master Degree programs. Work is offered on water resource, soil and water conservation or land use research projects. Applicants should have a Bachelor's degree in a conservation or agricultural field and grades must be above a "B" average. Inquiries should be directed to Prof. C. R. Humphrys, Department of Resource Development, Michigan State University, East Lansing, Michigan.

CALIFORNIA PARK POSITION

A nationwide, open, nonpromotional examination of a list of eligibles will be used to fill the position of Chief of the Division of Beaches and Parks in California. Closing date for filing applications is February 9, 1959. Forms can be obtained from the Cooperative Personnel Service, 801 Capitol Avenue, Room 555, Sacramento 14, California. The position has a salary range of $1,050 to $1,200 a month.

POPULATION REFERENCE BUREAU

It has been estimated that there were about 250 million people on Earth at the time of Christ. It took 16 centuries for that number to double. By 1650, there were about 500 million. The second doubling took about two centuries; the third doubling took one century. World population is now growing at the rate of 1.7 per cent per year, at which rate numbers will double in only 40 years.

Today, there are 2.8 billion people on Earth. Each day about 130,000 more are added. That means 47 million people each year—the equivalent of the population of Italy.

The problem—also the challenge—of the century is how the demands of the world's exploding population can be met; and how means can be devised to check this growth which if left continued will swamp the planet in misery. Few groups of people have a greater stake in the world population problem than do professional conservationists who must make do with what we have.

Since it was founded in 1929, the Population Reference Bureau, Inc. has pioneered in creating public understanding of the problems implicit in too-rapid population growth. A non-profit, scientific, educational organization, the Bureau gathers, interprets, and distributes population data. It is supported by memberships, subscriptions, and foundation and corporate grants and individual contributions.

One of the Bureau's main activities has been the publication of its *Population Bulletin*. Issued eight times a year, it is used as a source of demographic information by educators, librarians, laymen, editors, and publishers, research and technical specialists. Each issue is devoted to a particular aspect of the population problem or to an analysis of the demographic "health" of one country or area. Subjects covered by the *Bulletin* in 1958 include:

"India: High Cost of High Fertility"

"The American Negro at Mid-Century"

"Recession in Births?"

"Latin America: The 'Fountain of Youth' Overflows"

"Population Inflation Shrinks the Earth"

"Canada: Land of Plenty"

"The West Indies: New Bottle, Old Wine"

"World-Wide War on Malaria"

In 1959, at least four issues will be devoted to population trends in the United States. Another will analyze the world food situation. All of these will have specific bearing on conservation.

The Bureau also maintains an Information Service which supplies its members with up-to-date world-wide population data and interpretation.

The Population Reference Bureau is the only organization in this country—perhaps in the world—which is dedicated to public understanding of the population problem. It advocates no specific population policies. Rather, it endeavors to place the facts before the public so that an enlightened attitude will prevail. We are heartily in accord with the motto on the Masthead of the Scripps-Howard Newspapers: "Give the people the truth and they will find a way." When the basic truths of population growth are generally understood is there any likely prospect that intelligent population policies will develop? Further information regarding the Population Reference Bureau may be obtained from its headquarters, 1507 M Street, N. W., Washington 5, D. C.

FARM POND SAFETY

For about two years Assistant Professor of Education (Industrial and Rural Recreation Curriculum) Charles C. Stott, North Carolina State College, has been working with the Agricultural Extension Division in promoting farm pond safety. D. A. Williams, U. S. Soil Conservation Service, has prepared SCS Memorandum 133 regarding safety at farm ponds and other water resource projects on farms. In cooperation with such activities, the American Red Cross has prepared farm pond safety literature to promote boating and swimming safety.

Recently, too, a one-day Farm Pond Safety Conference was arranged on the North Carolina State College campus. There are a couple of million farm ponds scattered throughout the U. S., many of them in areas naturally lacking in natural surface waters. Therefore, there is considerable merit in this safety education program. It fills a definite need where people possess a minimum of traditional experience with and consequent respect for water hazards.

IRRIGATION USE OF WATER

Studies conducted during the past three growing seasons at Bushland, Texas, show that proper timing of irrigation and maintenance of soil fertility are required to make the best of water for crop production in the semi-arid High Plains areas of the Southwest. Hybrid grain sorghum was used as the test crop in the Bushland experiments which were conducted by engineers of the USDA's Agricultural Research Service in cooperation with the Texas Experiment Station. More specifically, the studies showed that greatest production efficiency resulted when at least 20 to 22 inches of soil moisture were available during the growing season; when soil moisture was adequate during the boot and soft dough stages of sorghum grain development; and when soil fertility was maintained at a high level by using up to 240 pounds of nitrogen and 30 pounds of phosphorus per acre.

WEEDS AND IRRIGATION

Unless the ditches that bring water to your farm are free of weeds, when you irrigate you may be adding something more than water to your fields. A curious research worker in Colorado took the trouble to count the weed seeds carried in water by a weedy ditch. An application of six inches of water per acre carried with it 170,800 weed seeds. It may take extra cultivation and spraying to keep these weeds from cutting crop production after they are once deposited in fields.

SOME ECONOMICS

R. A. Hinton, University of Illinois agricultural economist, says that back in 1910 a central Illinois farmer on good soils averaged only 50 bushels of corn per acre, and it took him 18 man hours and 46 horse hours to get the job done. At the present, in that same area, a farmer can produce 75 bushels of corn per acre with six man hours and 5.4 tractor hours.

TAKE TO THE AIR

Scientists are taking to the air to find a faster method for range vegetation sampling and rangeland evaluation.

The latest techniques in mapping range land conditions with the aid of aerial photos were described by Lynn Rader of the School of Forestry, University of California, at the Annual West Coast Photogrammetry Meeting held recently in San Francisco.

According to Rader, the use of aerial photos in mapping vegetation types and cultural features is well established. "The aim of recent research is to find a better means for sampling to determine grazing capacity—a slow and laborious operation by the usual method of surface reconnaissance."

Air and ground tests made on rangeland in an area typical of California annual foothill vegetation produced the following results:

(1) Color photography is far superior to black-and-white for forage evaluation in this vegetation; (2) photos taken in May will give best type delineation; and (3) where possible the scale of photography should be selected to fit the particular area and conditions involved.

Sampling operations are conducted to determine density of forage on the ground, composition by species (which determines the quality of the forage for grazing use), height of vegetation, and sometimes the pounds of forage produced per acre.

On aerial color photos made in May on a 1:2,000 scale, the researchers easily distinguished three forage-type areas: dark green showing highest density, lighter green showing intermediate density, and very light color showing lowest density. In weight of forage, these areas produced respectively about 2,400, 1,700, and 1,150 pounds per acre. And in species composition, the dark areas were found to contain mostly ryegrass while the lighter areas contained a greater amount of soft chess and oatgrass.

The large-scale photo method proved ineffective only in the determination of height of vegetation. Photos taken at a higher altitude on a 1:10,000 scale proved adequate for determining differences in species composition but showed little variation in density, height, or weight of forage.

For small, highly productive areas, the amount of detail possible on large scale photos should justify their use. For relatively low value forage types and where there is little variation between types, smaller scale photos such as 1:10,000 would be more appropriate.

The research has stressed technical methods rather than costs, and more study is needed to determine the economic feasibility of color photo mapping on rangelands.

COMING EVENTS

American Society of Range Management and **American Grassland Council** will hold a joint meeting in Tulsa, Oklahoma, January 27-30.

Florida Water Resources Conference will be held February 12-13, 1959, at the University of Florida and is open to the public. Florida *SCSA* Chapter will have representatives on eight committees.

A national symposium on wild turkey will be held at the Hotel Peabody in Memphis, Tennessee, February 13-14, 1959. Persons desiring more details should write Don Strode, Kentucky Department of Fish and Wildlife Resources, Frankfort, Kentucky.

National Future Farmers Week will be observed this year from February 21 to 28. The purpose of the Week is to "focus attention on the work of the Future Farmers of today, who will be the successful farmers of tomorrow," much more about which is discussed in a 12-page pamphlet just released by the Office of Education, Washington 25, D. C.

National 4-H Club Week will be observed from February 28 to March 7 by about 2,201,500 youth between 10 and 21, who belong to nearly 90,700 local 4-H clubs throughout the United States.

First International Farmers Convention in Israel will be held in Tel Aviv, March 29 to April 12, 1959. There will be paper sessions and many field tours. For further information write: Committee for the Farmer Convention, P.O.B. 184, Jerusaleum, Israel.

The **Sixth Watershed Congress** will be held at Hotel Statler in Washington, D. C., May 25-27, 1959. The Congress is sponsored by some 24 major agricultural, business, civic, and conservation organizations, including the SCSA. The 1959 program will feature a review of progress in watershed development and factors that will influence the program in the years to come.

The Seventh Congress of the International Society of Soil Science will meet in Madison, Wisconsin, August 15-22, 1960. Three extended field trips will be scheduled in addition to the paper-reading sessions. For further details write R. Bradfield, President, ISSS, Cornell University, Dept. of Agronomy, Ithaca, N. Y. Interested scientists may become members of the ISSS upon application and payment of the annual dues of $1 to L. G. Monthey, 2702 Monroe St., Madison, Wis.

AGRIBUSINESS IS BIG

Petroleum: agriculture buys more than any other industry.

Steel (finished): farmers take 6½ million tons.

Raw rubber: uses enough to put tires on nearly 6 million cars a year.

Gross freight revenue: 16 per cent is from agricultural products.

Chemicals: agriculture uses 50 million tons annually.

Electric power: more than Chicago, Detroit, Houston, Baltimore, and Boston combined.

Exports: 20 per cent consists of farm products.

In 1956, agriculture was a $14 billion customer for industry.

These are powerful reasons for advertising in the JOURNAL.

SOME CONSERVATION ECONOMICS

Conservation pays off in increased net farm income. A new USDA study shows that an investment of $3,714 in conservation practices over a 10-year period increased the annual net income of an Iowa test farm by $1,500.

While the type of conservation installed, the amount of money invested and the size of net income increase will vary on different farms—researchers say similar results may be expected generally.

First step on the 160-acre farm in the hilly area of western Iowa was analyzing the farm to determine what steps would be needed over a 10-year period to adjust profitably to conservation farming.

Generally, it went like this: First year, farmer invested in terracing, contouring, improved rotations, and additional fertilizer. Crop rotation would include increases in hay and pasture rotations and fertilization would permit addition of 3 more steers for fattening—and gradually work up from 7 steers at the beginning to 21 by the 10th year.

Gradually the entire farm set-up would be reorganized, including housing, and equipment, to handle the changed situation. According to the researchers, the farm's income would be reduced somewhat during the early years of the program, but near the end of the program, a sizeable profit will show.

SCSA MEMBERSHIP

(December 31, 1958)

North Carolina	530
Oklahoma	505
South Dakota	365
Iowa	350
California	332
Mississippi	326
Kansas	305
Michigan	297
West Virginia	295
Illinois	274
Virginia	268
Maryland	267
Tennessee	259
Georgia	257
Wisconsin	254
Nebraska	243
Kentucky	229
Pennsylvania	206
Indiana	200
Texas	198
Washington	188
South Carolina	182
New York	174
Ohio	172
Minnesota	170
Florida	168
Colorado	149
Alabama	147
New Jersey	144
North Dakota	142
Louisiana	103
Missouri	92
Oregon	89
Utah	86
New Mexico	77
Idaho	71
Arizona	70
Wyoming	65
Arkansas	60
Vermont	52
Montana	51
Maine	48
Massachusetts	48
Connecticut	44
New Hampshire	31
Nevada	25
Delaware	16
Rhode Island	10
Alaska	3
District of Columbia	97
Puerto Rico	33
Hawaii	13
A.P.O.	14
Canada	134
Foreign	429
Total	9,357

NEW CONSERVATION SCHOOL

In an attempt that is meeting initial success, "The National School of Forestry and Conservation" has been established at Wolf Springs Forest, Minong, Wisconsin, where field training wil be offered in forestry, wildlife conservation, and soil conservation. An extension school has also been set up with headquarters at 2144 P Street, N. W., Washington 7, D. C.

Courses are primarily for those who seek employment as aids or assistant technicians and for land-owners. Course materials have been prepared by Charles H. Stoddard, a professional forester, and reviewed by more than 20 specialists in federal, state, and private organizations, with some of these serving as a consulting faculty. Lessons have been pre-tested by students without previous background.

WIND EROSION CONDITIONS

Reports from 281 counties in the ten Great Plains States show that as of December 1, 1958, about 400,000 acres of land had been damaged by wind action. This compares with a little more than 100,000 acres damaged on December 1, 1957, and with 1,992,000 acres in 1956. The current USDA report also shows that an additional 8.3 million acres are in condition to blow this season, about the same as last year, but it compares with nearly 29 million acres in condition to blow on December 1, 1956. Farmers and ranchers in the Great Plains States are reported to have emergency-tilled more than 200,000 acres this year against erosion.

CONSERVATION EXPOSITION

During the 16th National Plowing Contest and Conservation Exposition, Aug. 21-22, 1958, held at Hershey, Penn., approximately 200,000 people from throughout the nation and Canada attended the affair. Of these people, 30,500 saw the "conservation shell" exhibit (*see photo, upper right*). Also shown in this photo are buses lined up to take the same number of people out onto the demonstration area where they met wagon trains consisting of 90 tractors pulling 180 wagons loaded with people over a 2,500 acre area where approximately 30 conservation practices were being established on the land. These practices were established through the cooperation of the various farm machinery heavy equipment people who donated their equipment and operators.

Ralph W. Hunter and **Charles Slaton,** SCS, Harrisburg, Penn., served as Chairman and Assistant Chairman, respectively, of the Conservation Division of the 16th National Plowing and Conservation Exposition. Both are *SCSA* members.

INDUSTRIAL-WISE

Hidden Hunger in Your Crops. Edited by Santford Martin. 48 p., illus. 1958. Dept. M. L., American Potash Institute, 1102 16th St., N.W., Washington 6, D. C. (Free on request.)

This handbook should help the farmer prevent hidden hunger in his crops . . . through soil tests, tissue tests, plant analysis, field trials . . . through a better understanding of the economic factors in fertilizer usage . . . a useful guide toward more profitable fertilizer treatments.

U. S. Steel Corporation publishes *American Farm Pictorial: The Nation's Rural Picture Paper* edited by Paul G. Strom who is a member of the *SCSA*. His address is U. S. Steel Corporation, Rockefeller Bldg., Cleveland 13, Ohio.

Rayonier Inc. has released information on radioactive tree injection. Radioactive carbon (C 14) has been used in the study of cellulose growth in pines. More complete information and photographs on this study can be obtained by writing Rayonier Inc., Att: Fred Henry, 52 Vanderbilt Ave., New York 17, N. Y.

An address, "Instrumentation for the Better Life", by Henry B. du Pont can be obtained from the **E. I. du Pont de Nemours & Co.**, Public Relations Dept., Wilmington 98, Delaware.

A useful booklet entitled "The Road Program . . . Myth or Fact?" by Boyd S. Oberlink can be obtained by writing **Allis-Chalmers Mfg. Co.**, Box 512, Milwaukee 1, Wis.

A complete series of booklets and information on aquatic weed control as well as a booklet on fish toxicant can be obtained from **Chemical Insecticide Corporation.** 30 Whitman Ave., Metuchen, New Jersey.

A recent booklet, "The Irrometer", describes new moisture indicator models designed to bring within the reach of every grower and irrigation farmer a single, accurate, reliable, and economical means of measuring soil moisture. **T. W. Prosser Co.**, P. O. Box 515, Arlington, California.

Several informative releases on the use of **Bakelite** vinyl film to prevent farm ponds and streams from becoming overrun with waterweeds can be obtained by writing News Bureau, Industrial Public Relations, Ltd., 655 Madison Ave., New York 21, N. Y. The vinyl film was tested by John F. Kane, USDA, SCS, soil scientist working in cooperation with **Bakelite Co.** The film has proven particularly useful where there is a combination of cold, fast-moving water.

Recently, **Climax Molybdenum Co.**, 500 Fifth Ave., New York 36, N. Y., announced an agricultural research program of grants-in-aid totaling nearly $20,000. Six colleges and universities and two research institutes were issued grants for 1958-59 to conduct further work on molybdenum response with specific crops.

"We Earn Our Way" is an address by R. S. Stevenson, President, **Allis-Chalmers Mfg. Co.**, given before the Southern Farm Equipment Manufacturers Association in September. A copy can be obtained by writing the company in Milwaukee, Wisconsin.

Several excellent articles on **plastic tiles, polyethylene film** for ditch linings, and **hexadecanol** appear in the Sept. 1958, *Irrigation Engineering and Maintenance* (624 Gravier St., New Orleans 9, La. 40c single copy).

Spring floods in the San Francisco Bay area were clearly demonstrated in a display made by sixth-grader Anne Marie Lembi using a Product Design tray.

CONSERVATION TRAYS

In California, the first week of March is set aside as Conservation Week. Schools and youth groups take on special activities to study the problems of floods, eroded hillsides, summer drouth and rapid urbanization.

Heavy rainfall last winter brought landslides in several suburbs, toppling expensive hillside homes. Flood waters threatened many tract homes built in low-lying areas. During most of Conservation Week the heavy rains continued and conservation became more than an academic subject.

The Cub Scouts of Woodside took on as their special project for Scout-O-Rama a display of the conservation problems in their own village. Woodside is a small community in the beautiful coastal range south of San Francisco. In the winter time the creeks rush down the slopes of the mountains; in the summer they are practically dry. The beautiful hills covered with second growth redwood are soon to be carved into homesites. The Woodside Cub Scouts have hiked over their area and are greatly concerned about this.

In their display they built models of bare hills and forested hills and sprinkled water over each to show how run-off carries away the soil. One scout demonstrated the underground water table by putting a well in his *Conservation Tray* and using a small lift pump to pump out the water. (Conservation Project Tray developed by PRODUCT DESIGN, 2796 Middlefield Road, Redwood City, California.) He explained to the visitors that in our California valleys we use well water to irrigate much of the orchard land and we must protect our watersheds so that water will keep seeping into the ground rather than running off to the ocean. Another scout had a model dam which turned a small generator, showing how water power generates electricity. Water spilled on the watershed above the dam drained into the reservoir.

The individual initiative shown by the boys in building their models surprised even their mothers. They wanted their display to be eye-catching and indeed it was. Conservation took on real meaning for them as they in turn explained it to their fellow scouts and parents.

The sixth-graders in a school in Belmont, a growing suburban town on the Peninsula south of San Francisco, also took their study of conservation very seriously. Their area is rapidly changing with hillsides being levelled for new homes. Nearby communities were flooded during the heavy rains.

Two students chose as their special project a classroom demonstration of floods and their causes. The local newspaper's headlines and pictures provided pertinent background information.

The students used the Conservation Trays to build their models and they and their classmates gathered subsoil, topsoil, plants, sod and twigs to make the scenes. The tray, which is made of polystyrene, is lightweight and leakproof and there was no problem in simulating a flood situation.

It was fun for the students and when learning can be expressed in terms of real life it has meaning to the learner.—SARAH T. CRONE.

Literature Briefs

Three Water Balance Maps of Eastern North America. By C. W. Thornthwaite, John R. Mather and Douglas B. Carter. 47 p., 4 figures, 4 tables, references, appendix: Monthly Values of Elements of the Water Balance at Fifty Selected Stations in Eastern North America. Three maps (scale of 1:5,000,000): Mean Annual Water Deficit; Mean Annual Potential Evapotranspiration; Mean Annual Water Surplus. Folder Container. 1958. Resources for the Future, Inc., 1145 19th St., N.W., Washington 6, D. C. $2.

These maps and the accompanying booklet are well worth the price of $2. They form a valuable additional tool that will be used increasingly by those engaged in various fields of water study and use. "The water balance of a given land area, land region or surface water body of the earth most simply stated is an input-output calculation of moisture receipts, retention, and loss (expenditure, dissappearance), over a given period of time."

Weather and Climate. By Clarence E. Koeppe and George C. DeLong. 341 p., color maps, appendices, (A) selected references (B) conversion tables (C) temperature of the dew point (D) relative humidity in per cents (E) table of sines (F) the Koeppe classification of climate (G) climatic data for selected stations, illus. 1958. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. $7.50.

This well-illustrated text and reference presents the subjects of meteorology and climate without recourse to mathematics or physics beyond the simplest concepts. Devotes a portion to the effects of weather and climate on agriculture. For those who have not been exposed to a course in this subject, this book will serve as an excellent introduction.

Soil Survey of McMinn County, Tennessee. By S. R. Bacon and others. 109 p., 9 figures, large colored single fold maps. Ser. 1948, no. 4. 1957. Sold by Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C.

This and the soil survey of Pasquotank Co., N. C., are in a new, large format of 9 x 11 inches. Maps are bound into the volume and each has but one fold, which makes them easier to use in the field, more durable and harder to lose, and eliminates the problems of multiple cross-folds. These volumes and their detailed maps should be useful for many purposes, but users should realize that the surveys on which they were based were made nearly a decade ago, as indicated by series designations. Noted here primarily because of change in format—size and map—of the series.

Single-Package Soil Testing. By George A. Barclay. *Plant Food Review*, Vol. 4, Nos. 2 & 3, pp. 19-21, 27-28, 1958. National Plant Food Institute, 1700 K Street, N.W., Washington 6, D. C. (Single copies, 35c.)

Describes an efficient testing service worked out in Gratiot County, Michigan.

Humus Losses in Great Plains Soils. By J. A. Hobbs. Vol. 11, No. 3, pp. 14-15. 1958, *Crops and Soils*, 2702 Monroe St., Madison 5, Wisconsin. (Single copies 35c.)

Summarizes some management practices that can be used in keeping up production and still maintain satisfactory organic matter levels.

Water Supply Conference, Proceedings of the Second State-wide. Water Resources Committee, Illinois State Chamber of Commerce, 20 N. Wacker Drive, Chicago 6, Ill. 56 p., processed. Aug. 27, 1958. $1.50.

The ten papers and discussion are largely directed toward pollution abatement, with emphasis on the role being played in industry.

Water, Watersheds . . . and You. By D. John O'Donnell. Trans. 22nd N. Am. Wildl. Conf. p. 196-213. 1957. (Abstract by author in *Wildlife Review*.)

Considers the values of the water and land resources and the importance of using the organized community watershed as the management unit. The Wisconsin program is reviewed and methods of operation are explained. The Four-Agency Agreement and the Commission policy on Watershed Management are discussed. An appeal is made for a single authoritative management agency combining all federal interests in water. A similar agency should be established in each state. All management would be on a watershed basis.

Preserving Natural Conditions in a World of Technological Dominance. (Symposium). Annual Report 1957, p. 5-15. 1958. Nature Conservancy, 2015 Bunker Hill Road, N.E., Washington 18, D. C. (No price given.)

The distinguished contributors to this symposium tell why preservation of natural areas is so urgent, where the needs are greatest, and what policies and lines of action should be followed. Papers are: *The Ultimate Limit of Our Resources*, by James Bonner. *The Preservation of Large Scale Areas*, by Donald S. Farner. *Conservation of Small Endemic Floras*, by Herbert L. Mason. *Visitor Impact upon Natural Areas*, by Russell K. Grater. *Our Social Responsibilities*, by Walter P. Cottam.

Timber Resources for America's Future. By U. S. Forest Service. 713 p., 139 figures. 1958. Supt. of Documents, Washington 25, D. C. $7, cloth. (From review by L. F. Stickel.)

This encyclopedic appraisal of our timber situation is the Forest Service's sixth "State-of-the-Union" report on timber. It consists of 13 sections: (1) summary, (2) forest land and timber, (3) growth and utilization, (4) forest protection, (5) productivity of recently cut lands, (6) forest tree planting, (7) ownership of land and timber, (8) timber resources of N. A. and the world, (9) future demand for timber, (10) timber supply outlook, (11) basic statistics, (12) definitions, converting factors, adequacy of data, (13) criteria for rating productivity. Sections I and II are available as separates from the U. S. Forest Service. The appraisal concerns itself strictly with timber supplies and needs, not with multiple-use values of forest stands. The outlook is for adequate timber supplies providing there is prompt and very substantial expansion and intensification of good forest-management practices. Among the highlights: Three-fourths of the forest land is in the East, but ⅔ of sawtimber volume is in the West. Total timber volumes are about the same as in 1945. Heavy reliance is placed on a small group of species. Timber quality is declining. Timber growth is increasing. Most eastern species now have favorable growth-cut ratios. One-fourth of timber cut is not utilized. Destructive agents, principally insects and disease, take exceedingly heavy toll. Fifty-two million acres need planting. Forest productivity is poorest on small farm and other private ownerships, especially in the South. Forest productivity is best on public and forest industry ownerships. Inadequate stocking is the most significant factor in reducing productivity of recently cut land. The key to adequate timber supplies in the future lies with the 4.5 million farm and other private holdings.

Statistics on Outdoor Recreation. By Marion Clawson. 156 p., 28 figures, 58 tables. 1958. Resources for the Future, Inc., 1145 19th Street, Washington 6, D. C. $2.

The author and his cooperators have brought together a great body of figures on our recreational areas and trends in their acreage and use. Data are presented in numerous tables and graphs and discussed in the text. Major sections pertain to national parks, national forests, wildlife refuges, TVA system, reservoirs built by Army Engineers, sales of boats and motors, state parks, municipal and county parks, hunting and fishing. Readers can use the data for a wide variety of purposes, but the general purpose of the volume is to study trends of use in relation to area and opportunity.

Pasture and Range Plants. Section 1, Native grasses, legumes and forbs, 26 p., 1955. Section 2, Native grasses, legumes and forbs, 38 p., 1956. Section 3, Undesirable grasses and forbs, 46 p., 1956. Section 4, Poisonous grassland plants, 26 p., 1957. Each completely illus. in color. Available on request from Sales Dept., Phillips Petroleum Co., 80 Broadway, New York 5, N. Y. (From a review in "*Wildlife Review*.")

A remarkable and beautifully illustrated series of pamphlets prepared with the aid of specialists and artists. The aim is to encourage intelligent use of grasslands. Advertising is held to a minimum and is not run into the text. To avoid monotony, facing pages are devoted to unlike species, colorful forbs alternating with grasses. Each species is shown by a large picture in full color, often with inset of an enlarged detail. Rest of the page for a species discusses characteristics, importance, and management. Text material is substantial and serious yet non-technical. Value of proper management, including conservative grazing, is mentioned throughout. The significance of a plant as an indicator of range condition is pointed out where appropriate. Control methods, mentioned for undesirable and poisonous plants, stress good grassland management as one important form of control. Important species have been selected for treatment, and references are cited, so the fact that many range and pasture plants have not been included is not too important. The series as it stands is excellent for extension use or as a supplement to our colorless technical works. Further sections are planned.

Introduction to Agricultural Economic Analysis. By C. E. Bishop and W. D. Toussaint. 258 p., index, 53 tables, 71 figures. 1958. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $5.25. (Reviewed by MARTIN MEYER, *Des Moines, Iowa.*)

Here is emphasized the elements of economics directly affecting agriculture and the interrelationship between agriculture and the rest of the economy. It is written primarily for use by colleges.

This book is divided into four sections. The first section emphasizes the reasons for economic organization, the functions of an economic system and the nature of decision-making in the operation of an economy. The second section deals primarily with problems involved in making production decisions. The third section is concerned with the forces affecting the demand for farm products with emphasis on the principles of consumer behavior. Section four deals with changes in economic conditions facing farmers over a period of time.

There is an abundance of graphic illustrations and tables.

A Treatise on Limnology, Volume I. By G. Evelyn Hutchinson. 1015 pp.; indexes (general, organisms, lakes, authors); list of mathematical symbols; bibliographies; illus.; 132 tables. 1957. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $19.50.

Two volumes will be published. They are directed primarily to those who are "professionally" involved in studying lakes. Volume II will deal with limnobiology and the ecological, typological, and stratigraphic problems of lake development.

Volume I gives as "completely as possible" the facts concerning geography, geology, morphology, chemistry, various cycles (hydrologic, iron, phosphorus, sulfur, silica, nitrogen), physical properties (optics, thermal, water balance), oxygen, minor elements, and organic matter.

Although each of the 17 chapters in Vol. I is prepared in a detailed and highly documented manner, each has a factual, undocumented summary of all the main conclusions. These summaries will be useful to elementary students of lakes. Much of the reporting throughout has been reduced to formulas—chemical and mathematical.

There is a multitude of lakes—and they are a valuable "natural" resource: serving many needs, their management stands high on the conservation list. Facts learned from research on natural lakes will also be useful in management of artificial impoundments.

Introductory Horticulture. By E. P. Christopher. 482 pp., illus., indexed. 1958. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. $7.50.

This is an up-to-date, well-organized introduction to horticulture with emphasis on fruits, vegetables and flowers, particularly for small properties rather than merely on commercial operations. Apparently one of the better texts in this field which is of interest to many readers of the JOURNAL.

Textbook of Dendrology. By William M. Harlow and Elwood S. Harrar. 561 p., index, glossary, illus., listing of state trees, derivations of some scientific names, selected references. 1958. (4th Ed.) McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y., $8.75.

For twenty years this text has been a standard for basic information on North American trees: taxonomic features, silvicultural characteristics and geographic distribution. All brought up to date in nomenclature, classification and reference to the literature. Range maps have been completely re-worked and some 1,000 photographic halftones used in illustrations.

The Traveling High School Science Library. 68 pp. Am. Assoc. for Advancement of Science, 1515 Massachusetts Ave., N.W., Washington 5, D. C. 25 cents.

List of 200 books that are now circulated among 1,400 participating senior high and preparatory schools in the United States. Also included is a list of career guidance material.

A Theodore Roosevelt Round-Up. By Hermann Hagedorn and Sidney Wallach. 184 p.., cartoon illus., reading list, significant dates in TR's History. 1958. Theodore Roosevelt Association, 28 East 20th St., New York 3, N. Y. 35c.

Arctic Wild. By Lois Crisler. 301 pp. with Foreword by A. S. Leopold. 65 photographs on 32 plates. 1958. Harper & Brothers, 49 E. 33rd St., New York 16. $4.95.

"Arctic Wild" will become an Alaskan classic with emphasis on the great, living Brooks Range Wilderness. The Crislers lived in this arctic part of Alaska for 18 months. Many of the remarkable film sequences, particularly on wolves, wolverines, and caribou, obtained by Herbert Crisler, can be seen in the recent Disney Studios production, "White Wilderness."

Lois Crisler shows perception and sadness in her book in declaring that, "it looks as if two movements are gaining their peak now: the power to wipe out our environment; the power to love it."

At this time when Alaska is becoming the 49th State of the U. S. A., "Arctic Wild" deserves careful reading, not only by Alaskans but conservationists everywhere. Some of the basic fundamentals of conservation stem from what we can learn from the "wholeness" of wilderness areas. Increasingly scientists are recognizing the value of wilderness areas and "natural areas" as "control" or "check" areas for a better understanding of developed lands.

Derniers Refuges/Atlas Commente Des Reserves Naturelles Dans Le Monde. International Union for Conservation of Nature and Its Resources. 214 p., 51 plates, maps & drawings. 1956. $10.50, cloth. (From review in *Wildlife Review*.)

In French. A major report on the world's nature reservations. It is beautifully illustrated with photographs of landscapes, animals, and plants and has many maps showing locations of preserves. Text is devoted to a country by country survey that tells what the status of nature preserves is in each land, gives information about many of the reserves, lists most of the rest, and discusses certain major ones at length. Introductory chapters discuss the role of preserves in scientific research, in conservation of species and communities, and in relation to industrial development.

The Past for the Future/The Story of the Nature Conservancy. By John L. Funk. From *Missouri Conservation* 19(2): 4-7, 5 figures. 1958.

Popular account of how Nature Conservancy operates to save samples of natural conditions, and list (with map) of 37 areas proposed for preservation in Missouri.

Science in the Federal Government: A History of Policies and Activities to 1940. By A. Hunter Dupree. Harvard University Press, Cambridge, Mass. 460 p., references, index, chronology of event, bibliographic note. 1957. $7.50.

This is scholarly and very readable. Of particular interest to conservationists are chapters XII and XVIII *(1865-1916;* and *The Depression and the New Deal)*. This book is excellent reading for those who may be particularly concerned with governmental policy and action decisions in the conservation of natural resources and better use of science.

News Notes

President's Column

IT IS a great honor and a privilege to serve as your President in 1959. I personally know many of our members, and I'm looking forward to meeting many more.

1958 is gone and the New Year is here. As this was written just before Christmas I'm especially hoping that all our members, their families, and our friends have had a most pleasant holiday season.

The year just passed was indeed one of great progress and growth in the *Society*. Not only was this marked by a big gain in members, but also in professional status, prestige and better service for the individual members and chapters.

More than 1,200 persons attended the annual meeting in Asheville late in October. The program had a variety of papers, panels, discussions and exhibits—all excellent. Some of the papers will be published in the JOURNAL. All the papers are being studied by a special committee for their significant contents so that the *Society* can appropriately follow up with ideas or courses of action on all matters that relate to material welfare and the conservation of soil and water and related resources.

The hospitality shown by our hosts in North Carolina and the citizens of Asheville was wonderful. The members who were there know that I've underestimated this point. We are very indebted to Ralph Sasser, Chairman and his committee, for a fine program, to all the persons who participated in the program, and to Charlie Patton and his committee of more than 100 members for the excellent arrangements. Asheville was a friendly meeting—state breakfasts, committee luncheons, working groups, receptions whenever they could be arranged, ten student members from the Rutgers Chapter and three student members from the University of Michigan taking in everything: awards, press room, tape recordings—and a constructive, dynamic, forward-looking conference.

Under Russell Hill's competent direction the Council, beginning three days before formal opening of the conference, met in sessions totalling well over thirty hours. I hope it will be possible for each of you sometime to be present with this working group.

I'd like to tell more about all the important business transacted, but space won't permit. More than 100 separate important actions were taken by the Council —79 of them require major follow-up action. Plans are being formulated, not only for 1959, but for two to ten years ahead.

Our objectives for 1959 are spelled out and printed in this issue of the JOURNAL. We are now operating under the revised By-laws which the members approved last fall.

Some Chapters will be conducting seminars or round tables on various subjects or topics—throughout the year and especially this winter, probably at institutions of higher learning. These seminars may be a source of technical or nontechnical material to be published by the *Society*.

A Development Fund Board will be appointed at our spring meeting of the Council in Washington, D. C., on March 17-18. Incidentally, all reappointments and new appointments to 1959 *SCSA* Committees was completed December 15. A few special appointments will be made in the next month or two as needed. I'm very grateful to the Chapter officers and others who helped with this job. It's just too big for one person.

* * *

Our annual meetings are important and we can be proud of them. Gary Bobst of Lincoln, Nebraska, and his committee members are working on this year's Rapid City program. He will welcome your suggestions, but must have them very soon.

* * *

It seems needless to remind ourselves that the major part of *Society* effort and accomplishment is done day by day, week by week, and month by month throughout the year. More chapters and student chapters with programs; committees at work; the *SCSA* office in Des Moines, Iowa, moving ahead; your officers and others constantly working with many other international, national, and local groups—this is you and your *Society* doing many, many things.

Canada is now entitled to one regional member on the Council. Our Executive Secretary has directed the conduct of an election for the purpose.

National dues have not been increased this year—they are still at the old rate of $5. This, I hear, is always good news. Holding the line on dues is pretty tough this year with prices going up on most everything. Those who can afford it are invited to enroll as a "Sustaining" member. The price is $25. One can take out a personal sustaining membership as long as he is able to do so and later return to the regular rate. This is a voluntary thing; we know there will be good response. The dues statement this year has provision for this personal sustaining membership. It's just a way to contribute to a very worthy *Society*. In any event, whether you pay $5 or $25, may I suggest it be promptly—*do it now*—if you already have not—because it cuts clerical and mailing costs immensely.

A final remark concerns the Soil Conservation commemorative stamp. Probably you've seen the Postmaster General's press release. The new 4 cent stamp will be released at our Rapid City meeting August 26, at ceremonies during this first day. Details on the stamp and program will be forthcoming from our Executive Secretary from time to time. This is a good thing for the *Society*, for the people of South Dakota, and for all organizations and agencies and people working with the land, water and related resources.—ALVIN C. WATSON, *President*.

Secretary's Column

THE USDA held one of its research hearings in Des Moines. A statement, made by the secretary after opinions had been solicited from council members, officers of the *Society*, and others, is available on request.

The 1959 membership goal is about 2,500. G. L. Winchester is chairman of the committee.

A new revised membership application blank and a new *Society* brochure are available.

North Carolina was the over-all winner in the Chapter Achievement contest. Wisconsin, South Dakota, West Virginia, and the Inland Empire Chapters were winners in their respective regions.

Annual meeting papers are still available at no charge to each of the chapters. A charge of 25c a paper or $2 for complete set is necessary for individuals who were not registered at convention.

Chapter exhibits and commercial exhibits at Asheville were well-received. It is not too early to plan exhibits for Rapid City and even Guelph, Ontario, annual meetings.

Nominations for officers and Council positions are due April 30, 1959. The election this year is earlier than usual; dates are geared to the annual meeting. Nominations should be sent to Herbert A. Flueck, 517 Federal Courts Building, St. Paul 2, Minnesota. (For guidance in making nominations please refer to the new Bylaws, particularly Article VI. See the July 1958 JOURNAL for these Bylaws.

The new Bylaws were adopted by a vote of 1,585 to only 18 not in favor. Printed copies of the Bylaws are available on request.)

Nominations will be accepted for: President; First Vice-President; Second Vice-President; and one member-at-large for the Council. Members in the Great Plains and the Southeast regions will elect representatives to the Council this year. Canada is currently holding an election to determine its representative who is expected to meet with the Council this March.

Nominations for Fellows and Honorary Members are due in the office of the Executive Secretary in Des Moines not later than May 29, 1959.

Nominations by Chapters for "Commendation Awards" are likewise due in the office of the Executive Secretary not later than May 29.

The Story of Land was again promoted in a letter sent to all Soil Conservation Districts in November. Sales during December were good.

The Wonder of Water sales have been good throughout 1958. With current orders the 500,000 mark will probably be exceeded. About a fourth of all Chapters have signed the agreement with the parent *Society* to promote sale of booklets and thereby receive commissions.—H. WAYNE PRITCHARD, *Executive Secretary*.

PAST-PRESIDENT HILL COMMENTS

Another year in the life of the *Soil Conservation Society of America* has been completed. Serving as your *Society* President has been a profitable experience to me in many ways. I have enjoyed your confidence and support. Significant advancements in the *Society* have occurred during the past year. These accomplishlishments would not have been possible without the conscientious help from many *Society* members. I am especially grateful to the nearly 500 members who served on the 27 *Society* committees. Facilities do not make it possible to express my appreciation personally to each of you. I am, therefore, making this use of the JOURNAL to tell you how much I appreciate your assistance.

I am sure that 1959 will be another banner year in *Society* history. I know that you will give President Watson and other officers and Council members the same fine support that you gave during my administration. Thank you again. Best wishes for the *Society's* future.—RUSSELL G. HILL.

TWO MEMBERS RECOGNIZED

Two long-time members of the *Society's* Council left the governing body on December 31, 1958. J. S. Russell of Des Moines, who had served on the Council for six years, was Treasurer in 1952-53-54, first Vice-President in 1956, President in 1957 and an ex-officio member of the Council in 1958.

Mr. Russell's service to the *Society* was noted in 1957 when he received the degree of Fellow. In his daily work as Farm Editor of the *Des Moines Register and Tribune*, he has done much to awaken the public to the importance of soil conservation. His proximity to the *Society* headquarters meant that he was frequently consulted by staff members on *Society* matters. He is also a world traveler with many contacts in other facets of American and International life and this was advantageous to the *Society* during the years he served .

Harry Chambers first became a member of the *Society's* Council in 1956, the year the convention was held in Tulsa. He worked with many *SCSA* committees in Oklahoma as well as committees for the parent *Society*. In 1958 he was chairman of the finance committee.

The Oklahoma membership grew during Chamber's term in office so it ranked tops in the country. A student branch, and several new chapters were formed in Oklahoma—the state now being entirely covered by chapters.

Early in 1958 Harry Chambers was transferred from his position as Deputy State Conservationist in Oklahoma to the position of Director of the Carribbean Area for the Soil Conservation Service with headquarters in San Juan, Puerto Rico. In the past few months a new chapter has been formed in Puerto Rico and *SCSA* membership has tripled. Chambers is a real leader in soil conservation and his practical service to the *Soil Conservation Society of America* has been invaluable.—H.W.P.

SOIL CONSERVATION STAMP

The Post Office Department is going to issue a soil conservation stamp in 1959. It will be released at Rapid City, S. D., on August 26, 1959, in connection with the annual meeting of the *Soil Conservation Society of America*. The Post Office people have expressed a preference for releasing the conservation stamps in collaboration with the professional and scientific societies.

In his announcement, Postmaster General A. E. Summerfield said the stamp "should help focus public interest on the extensive soil conservation efforts being made by Federal and State governments, local Soil Conservation Districts, Watershed Associations, and other public and private groups." The printing order is for 120 million stamps. They will attract good attention. This is a distinctive honor for the *Society*, which will also prepare the official first-day cover envelope.

GLOSSARY REVISION?

In 1952 the *Soil Conservation Society of America* published the first soil and water conservation glossary. It appeared in the JOURNAL and later was made available for $1.00 from the *Society* headquarters.

With new developments in soil and water conservation there has been some discussion regarding the need for a revision of the glossary. Printing a glossary is an expensive process. If it would serve the members to have a revision at this time, or within the next three years, then the Council will give the matter additional consideration. Right now, comments from members should be sent to the Executive Secretary, Soil Conservation Society of America.

Schedule Rapid City now!

COMMENTS ON CONVENTION

To the Editor:

I would like to make the following remarks relative to the recent convention of the *Soil Conservation Society*.

The views which I shall express are not necessarily those of the organization which I represented at the convention; and for them only I am responsible. Rather I am writing primarily as a member of the human race.

At the convention able men from varied fields of conservation emphasized utilization efficiencies to match the rising resource demands of our rapidly increasing population. Some of these demands are hardly being met today, and none of these experts could see anticipated demands being met beyond the 1970's.

In regard to water and to lands suitable for several conservation needs, not even present demands are being met, and we may never be able to meet these demands so long as the present acceleration of population growth maintains.

Many speakers convincingly indicated that every technique of science and technology is being applied in a desperate attempt to conserve non-renewable natural resources, and to increase the production of renewable resources. I am all for this! However, throughout almost all of the thinking presented at the convention there was a conspicious omission.

All discussions of the problem of balancing resources and population took the approach that somehow resources must be adjusted to population. The obvious and sensible alternative (indeed necessity!) of adjusting population to resources was neglected. This is an approach which would be instantly considered were we dealing with overgrazing, the family budget, or the alarming fertility of the family dog or cat—and I am not being disrespectful of human nobleness in saying so! Rather the apparent blindness of so many to this approach is testimony for human weakness, and perhaps indicative of a hidden social neurosis stemming back to primitive times when the group with the fewest members lost out in competition with its more populous enemies.

If from the number of births in the world during the day, one subtracts the number of deaths, he finds that the world's net daily increase of population is around 100,000.

About every ten seconds there is an extra American.

For some considerations man is effectively an animal. He is subject to biological laws. Man can thrive in harmony with those laws by, among other things, controlling his numbers, or he may permit a large and increasing fraction of humanity to continue to suffer the tragedies of early death (e.g. Asia) and unrealized human potentialities. There can be no satisfactory balancing of resources and population so long as the population continues to increase.

Furthermore, there is so much more involved than just the stuffing of men's stomachs. There are social and aesthetic values ranging from crime, mental health, traffic and general congestion, stagnation induced by complexity, landscape and community standards, to the spiritual exhilaration of outdoor adventure.

Any sound balancing of resources and population must be based upon a constant population.

It is not my purpose here to discuss how a constant population might be achieved; rather at this time I wish to define an objective!

Suppose you have a bucket in which you desire to maintain a certain level of water. Suppose also that the bucket has a hole in the bottom—a hole which is getting larger at an increasing rate all the time. You could increase the flow of water into the bucket and you could stop the growth of the hole. You would be wisest to do both!

DR. DAN HALE
240 Scott St., N. E.
Knoxville 14, Tenn.

NEW COUNCILMAN APPOINTED

E. D. Bolton, P.O. Box 910, Nacogdoches, Texas, has been appointed to the *SCSA* Council for one year to replace the Councilman-at-large position formerly held by Walter C. Gumbel. Gumbel is now serving on the Council as second vice-president.

Bolton is a native of Texas and obtained his B.S. degree in agricultural education from Sam Houston State with graduate work at Colorado State College and Texas

E. D. Bolton

A. & M. and taught vocational agriculture for 12 years. He has been associated with the Soil Conservation Service since 1935 and is now area conservationist. In 1958 he received a Certificate of Merit from the State Conservationist of Texas and a Superior Service award from the Secretary of Agriculture.

Bolton sponsored the organization of the East Texas *SCSA* chapter in 1953 and served as its first president. He also served on the *SCSA* Program Committee in 1956 and has attended many of the *SCSA* conventions.

GRASSLAND COUNCIL

American Grassland Council anounced election of representatives to its Board of Directors. Several are members of the *SCSA:* **M. A. Sprague, B. D. Blakely** (official representative of the *SCSA* and a Grassland Council vice-president and a member of its publications committee), **W. H. Garman, George D. Scarseth, Albert Clark, Carl Bender,** and **F. E. Bear.**

The Grassland Council is exploring the possibilities of obtaining an editor and publishing a quarterly magazine.

John W. Barnard, a charter member of the *Society,* and Council member for the Northeast Region, has been elected to the Scientific Manpower Commission for a three-year term. Barnard was nominated by the Policy Committee for Scientific Agricultural Societies on which he represented the *SCSA.*

The *Society* was represented at a meeting of the **Water Resources Council,** December 5, 1958, in Washington by Alvin C. Watson. Watson reported for Bernard Frank on the Council's watershed development committee.

A. H. Veazey, council member for the Southeast, recommends that the chapters in his area (can apply elsewhere) prepare in advance a chapter plan of work.

CANADA TO ELECT COUNCILMAN

From a poll of *SCSA* members in Canada an overwhelming majority favored the formation of a Soil Conservation Society of America region in Canada. The approved revised By-laws of the *SCSA* have included Canada as a region.

Each member in Canada has by now received an announcement of the procedure to be followed and a list of members in Canada. Nomination will be made following the prescribed By-laws (by Chapter petition or by the signature of 10 members). A ballot of the slate of candidates will be sent to all Canadian members about January 23. The voting period will be 30 days. Ballots wil be counted on February 24. Because of this time element, and so that the newly-elected councilman can be invited to attend the spring meeting of the Council, March 17 and 18 in Washington, D. C., each member in Canada should complete his voting and return the ballot promptly.

JOURNAL HONORED

The JOURNAL OF SOIL AND WATER CONSERVATION, 1958 issues, has been selected to be a part of a USDA mobile exhibit for the Foreign Agricultural Service. The exhibit, being prepared by the Reynold Feal Corporation of New York City, is scheduled to open at the Verona Trade Fair in Italy on March 8, 1959, and subsequently will be displayed throughout Western Europe.

* * *

The JOURNAL received recently a certificate of recognition from the National Wildlife Federation. The award read: ". . . For service rendered in giving the American people a truer appreciation of the need for protecting their public land heritage."

YOU THINK OF ONE!

Several slogans for the 1959 convention have been suggested:

"To Rapid City make a beeline in '59."

"SCSA convention in '59; For you and family will be fine."

These are "simple" reminders that it's not too early by the Zodiac sign to schedule CONVENTION 1959.

Chapter Newsletters are already publicizing this 14th annual meeting which will be held in Rapid City, South Dakota, August 26 through 29. And, there is evidence that many an *SCSA* member is making plans not only to attend the convention but to get the family involved in a fine vacation.

Association of Southern Agricultural Workers, Soil and Water Conservation Section, will meet February 2-4, 1959, Memphis, Tennessee. Starting in 1960 this section will be sponsored by the *SCSA.* Edgar A. Hodson, 1708 North Tyler Street, Little Rock, Arkansas, is chairman of the 1959 section meeting in Memphis. He is anxious to see a large number of *SCSA* members present.

JOURNAL ARTICLES AWARDED

Four authors were honored by the Soil Conservation Society of America during its 13th annual meeting at Asheville.

Each year Society members have an opportunity to vote on and select three articles which appeared in the JOURNAL OF SOIL AND WATER CONSERVATION in the year previous to the balloting.

The authors and papers which received top recognition this past year are: R. G. Gustavson, "Water, the nation's concern today—a problem tomorrow"; Roger D. Hale, "Conservation—can it be a career?"; E. J. Niederfrank and Wendell R. Tascher, "The human side of watershed programs."

R. G. Gustavson is president and executive director of Resources for the Future, Inc., Washington, D. C. Roger D. Hale is director of studies in the field of graduate training for The Conservation Foundation, New York. E. J. Niederfrank is extension sociologist and W. R. Tascher is extension conservationist. Both of these last authors are located in Washington, D. C. with the USDA, Federal Extension Service.

LETTERS

To the Secretary:

The meeting at Asheville was quite a success. I am convinced that the Society is now firmly grounded and on its way to much bigger and better things. It will take a lot of doing if we are to live up to our obligations and opportunities.

FIRMAN E. BEAR
New Brunswick, N. J.

[The following letter was sent on by O. M. McConkey of Elora, Ontario. Dr. McConkey has been serving as chairman of the Society's International Relations Committee.—EDITOR.]

Dear Mr. McConkey:

You will be glad to hear that next Saturday at this time [November 1958] we [will] be inaugurating the Soil Conservation Society of Ceylon. Most of your students [will] be there. I shall convey your good wishes to everyone. I have been quite busy on this job for months and I am so happy that I have been so privileged to take the initiative. I thank people like you and [particularly] for the encouragement, inspiration and guidance that was bestowed on me.

I shall send you some newspaper cuttings about it. I have contacted the United States Operations Missions in Ceylon who are tackling ICA work here. The moment we have started the Society I am going to start on a conservation education project. I confidently hope you will be able to give us a helping hand in these projects.

SUMITH ABEYWICKREMA
Morawka, Ceylon

"To me one of the most important types of cooperation is with County Soil Conservation Districts. *Saving and building the soil* is fundamental to all our farm programs and to our future as a state. It *should have first place in all farm plans.*"
—R. K. BLISS, *Ames, Iowa*

President's Citations and Commendation Awards 1958

IN 1958 THE SOIL CONSERVATION SOCIETY OF AMERICA added to its "recognition" program the "President's Citation" and the "Commendation Award." Since its beginning the Society has, through its Fellow and Honorary Member program, honored outstanding men in the field of soil and water conservation. A Fellow is advanced from a professional member, while an Honorary Member may or may not be a member. These honors are provided for in the Bylaws and are the highest forms of recognition the Society gives today. (A guide sheet on nomination procedure and a list of all Honorary Members and Fellows, and guide sheets on the "President's Citation" and the "Commendation Award" can be obtained from the Executive Secretary on request.)

The "President's Citation" and the "Commendation Award" are given for outstanding contributions to the Society. In effect they say "Well done!"

The "President's Citation"

The President's Citation is an honor conveyed to no more than ten individuals each year in recognition of their unusual and extraordinary activities that have been of particular significance, regionally or more, to the Society. Under certain conditions a non-member may be recognized. A framed certificate stating the citation and signed by the President is presented to the recipient during the annual meeting.

Selection for this honor is made by the President. His selections may be made from those approved by the Awards Committee for commendation or from others known to him. The Award's Committee can make recommendations for citation, but final selection is left to the President and the approval of the Council. A President's Citation shall not be given more than once in three years to the same person.

Those who received the "President's Citation" in 1958 and were so recognized at the Asheville convention are:

HARRY M. CHAMBERS is a devoted member of the *Society*. He has served diligently as a Council member and chairman of the Finance Committee. His efforts in organizing the Oklahoma State Council of Chapters and aiding in the start and continuing programs of eight chapters in Oklahoma are well known. He is now devoting himself to similar efforts in Puerto Rico. For these and many other services to the *Society*, he receives this Citation by the President.

WINFIELD S. HARRISON has served the Michigan Chapter diligently as its Secretary-Treasurer since January 1952. Through his leadership this Chapter has become one of the larger and more active in the country, winning the first National Chapter Activities Award in 1957. He has also been responsible for instigating a technique whereby chapters could collect *SCSA* dues. For these and many other services to the *Society*, he receives this Citation by the President.

I. O. HEMBRE has served the *Society* most diligently as chairman of the Chapter Activities Committee. On the work of this committee depends much of the *Society's* future as a force in conservation. For this service, his many contributions to the Wisconsin Chapter, and his devotion to the cause of soil and water conservation, he receives this Citation by the President.

HERBERT A. HOPPER has served the *Society* as a faithful and most diligent member of the Council and as Chairman of the Awards Committee. His contributions to the 1957 Annual Conference were many. For these services and many more, including his work with chapters in the Western Region, he receives this Citation by the President.

CHARLES R. PATTON, formerly residing in North Carolina but now in Tennessee, has done excellent work in serving as chairman of the Local Arrangements Committee for the Thirteenth Annual *SCSA* Conference. His careful planning and leadership was evidenced in the success of the conference. For this and other contributions to the *Society* and chapters in North Carolina and Tennessee, he receives this Citation by the President.

JULIEN J. PROSKAUER, sustaining member of the *Society* and President of the William C. Popper Company, publisher of the *Society's* two educational cartoon-

style booklets, has gone far beyond the normal responsibilities of a publisher in his efforts to make the booklets and their distribution a successful *Society* program. He has always placed the welfare of the *Society* uppermost and consistently promoted the cause of soil and water conservation in his business connections. For these and other contributions, he receives this Citation by the President.

J. R. SASSER served as chairman of the Program Committee for the *Society's* Thirteenth Annual Conference. For arranging a most outstanding program; for his distinguished service on the Editorial Board of the JOURNAL OF SOIL AND WATER CONSERVATION; and service to chapters in Tennessee, he receives this Citation by the President.

FELIX SUMMERS has made many contributions to the *Society*. He designed its emblem; he has served as "Contributing Artist" to the JOURNAL OF SOIL AND WATER CONSERVATION, aiding materially in its layout design and art work. His "Soil Conversation" cartoons, first appearing in the JOURNAL, and later distributed commercially in mat sets by the *Society*, along with his many hundreds of other cartoons, are worth hundreds of thousands of words. Through these works and other, and through his association with the Wisconsin Chapter, he receives this Citation by the President.

WENDELL R. TASCHER has long been active in many educational phases of soil and water conservation. He has served on many *Society* committees and currently through his chairmanship of the Information Committee is breaking new ground for the *Society*. He has made several notable contributions to the JOURNAL OF SOIL AND WATER CONSERVATION and has been an effective member of the Washington, D. C. No 1 Chapter. For these and other contributions he receives this Citation by the President.

GEORGE L. WINCHESTER is a leader in the North Carolina Chapter which has become one of the outstanding chapters in the *Society*. His contributions range widely, although his work is noteworthy in membership, sale of and developing educational use of *Society* publications and promotion of conservation action programs among both urban and rural peoples of North Carolina, and reaching the goal of a national conference in North Carolina. For these and many more contributions, he receives this Citation by the President.

The "Commendation Award"

The "Commendation Award" is largely a chapter program although nominations may be made by officers and Council members of the parent Society. A chapter shall make not more than one nomination annually for the Commendation Award. Selection shall be based primarily on an individual's efforts at the local, state, or regional level in line with the Society's objectives, growth, and activities. The Awards Committee reviews all nominations for the Commendation Award, primarily to see that a uniformity is maintained throughout the Society in giving this award. A "Letter of Commendation" signed by the President is awarded to each recipient in a suitable ceremony during the annual meeting. Chapters may undertake a subsequent award ceremony on a local basis, thus giving further recognition to recipients.

Those who received the "Commendation Award" in 1958 and were so recognized at the Asheville convention are:

HELEN K. BOYER (Old Line Chapter of Maryland)

WILLIAM M. BRIGGS (Hoosier Chapter of Indiana)

RUTH T. DOUGLAS (Virginia Chapter)

RONALD B. ELMES (Oregon Chapter; nominated by a member of the Council)

LOWELL J. FARMER (Utah Chapter; nominated by a member of the Council)

HERBERT C. FLETCHER (Ft. Collins, Colorado; nominated by a member of the Council)

CLARK H. GLEASON (San Francisco Bay Chapter; nominated by a member of the Council)

ROBERT L. GUICE (Rio Grande Chapter of New Mexico)

FRED A. HAUGHTON, JR. (San Francisco Bay Chapter)

FRED W. HERBERT (San Francisco Bay Chapter; nominated by a member of the Council)

C. LINDSAY HUNT (North Carolina Chapter; nominated by a member of the Council)

RAMON L. KENT (Inland Empire Chapter of Idaho and Washington; nominated by a member of the Council)

IRVING B. STAFFORD (Empire State Chapter of New York; nominated by a member of the Council)

J. MURRAY THOMPSON (Washington, D. C. No. 1 Chapter)

GEORGE O. WALKER (Northern Illinois Chapter)

DAVID T. WEBB (Mississippi Chapter)

Goals for 1959

Each year the Soil Conservation Society of America *has established certain goals. The members work toward a realization of annual goals and much has been accomplished each year.*

The major goals for 1959 are:

1 To further strive to improve the JOURNAL OF SOIL AND WATER CONSERVATION. A special committee during 1959 will study the matter of increasing the amount of advertising, the number of issues per year, financing and other related matters. A set of guide-lines for prospective authors will be developed by the Editor in cooperation with the Editorial Board and others.

2 To strengthen the development of chapter programs through the Chapter Activities Committee, standing committees, the *Society* Council and office staff, and with the cooperation of each chapter.

a. A regional and national chapter achievement awards program will be conducted on a revised basis.

b. Special or regular session of the annual meeting program will be established for chapter delegates.

c. Sponsorship of soil, water and related resources conservation seminars by chapters will be encouraged.

d. More emphasis will be given to student chapters and student branches under the new Bylaws. A session for them will be held at the annual meeting. A special section of the chapter achievement awards program will be devoted to student chapters.

3 To enlarge the program in the printing and distribution of special publications.

a. The popular-type booklets for the general public—**The Story of Land** (English and Spanish editions) and **The Wonder of Water** will continue to be distributed.

b. A new popular-type booklet on the theme of a beautiful America will be developed.

c. The special publications committee will produce a special brochure on "Conservation Careers."

Additional plans have been made for the publication of technical papers during 1959 and the *Society* will continue to distribute those now available—**Our Watershed Resource; Land Utilization in the United States;** and the **Glossary of Soil and Water Conservation.** Work will be continued on the version of the Glossary in Spanish.

4 To activate the new Bylaws of the *Society* approved by the membership during 1958. Canadian members will elect a representative on the *Society* Council, a new fiscal year for the *Society* business will be established, and a Development Fund Board will be formulated. This Board will seek grants of money to carry on enlarged projects in keeping with *Society* objectives.

5 To strengthen soil conservation throughout the world with contacts for the *Society* made through the International Relations Committee and others. The chairman of the Committee will serve on the subcommittee established in 1958 by the Ecology Commission of the International Union For Conservation.

6 To continue representation for the membership of the *SCSA* with: the Natural Resources Council; the American Grassland Council; the Water Resources Council; the American Association for the Advancement of Science; the Policy Committee for Scientific Agricultural Societies; the Scientific Manpower Commission; the International Union for Conservation; the National Watershed Congress; and the Conservation Education Association. The *Society* will also have designated representatives at various other meetings during the year.

7 To submit during 1959 the report of the Committee on Public Policy to Chapters for ratification, and thence to the members. This will be the first Society-wide attempt to formulate broad *SCSA* policy relative to conservation and utilization of land and water resources.

8 To attain during 1959 a membership well in excess of 10,000 and to increase participation of members in the affairs of the organization.

9 To hold the Fourteenth Annual Convention of the *Society* in Rapid City, South Dakota, August 26 through 29, 1959.

10 To carry forward the work of the organization and to direct the efforts of the Council and staff through committees and chapters. At least 500 members of the *Society* will be serving on thirty *SCSA* committees.

CHAPTER NEWS

EDITOR'S NOTE: In the 1958 volume of the JOURNAL, *in the "Chapter News" section and elsewhere in a number of issues, there were 58 chapters noticed for a total of 125 separate items. In some ways, this news furnishes a backlog of ideas for all chapters and reports progress made in programs and projects. Three longer articles on chapter activities were also published. Obviously not all materials submitted can be used. Much "local interest" material is carried in individual chapter newsletters, letters from chapter officers, and letters from Council Members (regional). Overall Society affairs have been carried to the chapters through regular communiques from Council members, officers, and the Society's Executive Secretary, H. Wayne Pritchard.*

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In view of the March 17 and 18 meeting of the Council you may wish to communicate with your regional Councilman. *Northeast*—John Barnard, Soil Conservation Service, Washington 25, D. C.; *Southeast*—A. H. Veazey, P.O. Box 5126, Raleigh, North Carolina; *North Central*—Minott Silliman, Jr., 929 So. Myrtle St., Kankakee, Illinois; *Great Plains*—H. G. Bobst, Room 604, 134 S. 12th St., Lincoln 8, Nebraska; *Western*—H. A. Hopper, 3374 Mt. Diablo Blvd., Lafayette, California. *President* Alvin C. Watson, 7600 West Chester Pike, Upper Darby, Penn.

California Chapter—Members of the *Society* residing in California have joined together in a statewide California Chapter which has recently been approved by the Council of *SCSA*. Formerly, two chapters existed in California: the Southern California Chapter in the Los Angeles area and the San Francisco Bay Chapter. All *Society* members in California will now have the opportunity to partake in chapter activities. Officials of the new group have indicated they plan to hold a state-wide *Society* meeting. Officers of the new California Chapter are: Chairman, Sven G. Anderson, 1515 "O" St., Apt. 15, Sacramento; and Secretary, Dr. Esther P. Perry, Dept. of Soils & Plant Nutrition, University of California, Berkeley 4.

Florida Chapter requested a tape-recording of a luncheon address made by George Browning at the Asheville convention of the *SCSA*. The recording made on a single track tape at speed of 7½ ips is all right for playback or dubbing onto another tape. Florida expects to release a tape for use by each sub-chapter in the state. Henry Wilkinson of the Extension Service, Raleigh, North Carolina, engineered all tape recordings made at the convention and did an excellent job.

Hoosier Chapter (Indiana) held its annual meeting January 9 at Butler University in Indiapolis with the general theme, Research in Soil and Water Conservation, with "minimum tillage" featured.

Iowa Chapter has collated a loan set of slides telling the conservation story from early settlement in Iowa, about 100 years ago, to the present day. There are four complete sets. Slides can be obtained by writing to the SCS Film Library, 405 Iowa Bldg., Des Moines, or Visual Instruction Service, Iowa State College, Ames. A mimeographed script accompanies the slides which would be of interest if shown at general information meetings on conservation, schools, or youth groups.

Another Iowa project successfully completed during 1958 involved a large participation statewide in a photography contest. Cash prizes were awarded winners in two divisions: black and white and transparencies and color. The chapter plans to repeat the contest in 1959.

Frank Schaller is the Chapter's official representative on the Iowa Conservation Education Council. He is serving on the Editorial Committee, along with Chapter Chairman Charles Ballantyne, and will prepare a soils section for a proposed guide for teachers which the Council plans to publish this year.

Northern Illinois Chapter held its annual *SCSA* meeting November 6, 1958, and it was a "grand success" according to that Chapter's Newsletter. New officers were elected for 1959: Chairman, Reece Ayers, Kankakee; Vice-Chairman, Homer Kuder, Champaign; Secretary-Treasurer, Harry Beeson, Decatur. Members, wives and friends totaled over 100 at the meeting.

Fifty-eight members attended a dinner meeting of the newly organized **Fort Hays Chapter** of the *SCSA*, December 6, in Hays, Kansas. New officers elected for the coming year are: Virgil Quint, chairman; Leo Veinhold, vice-chairman, and Kenneth Albright, treasurer. Dr. F. W. Albertson, head of the Botany Department of the Fort Hays State College, who was guest speaker, illustrated with colored slides his recent work in soil conservation in India.

High Plains Chapter (Northwest Kansas) has made plans to sponsor an essay contest among FFA groups. Any information on similar contests would be gratefully received by E. Wayne Brenn, Oakley, Kansas.

Louisiana Chapter met September 19 with 65 members present. Although this chapter has not yet received its charter, it is in the process of being organized and hopes to become chartered at an early date. *SCSA* members in Louisiana who would desire to become members are encouraged to correspond with either Wayne Fallin, chairman, 1425 Donahue Ferry Road, Pineville, or Ray Brandt, secretary, Box 471, Alexandria.

Old Line Chapter (Maryland) appropriated $10 each for the first 15 members to apply for the National Convention at Asheville. Chapter members participated in "Maryland Land Week", October 5-11. The chapter exceeded its membership quota of 60 for the year 1958.

Mississippi Chapter, which ranks fourth in the number of members, met Nov. 18 in Jackson, with 99 members present. Officers for 1959 are: C. W. Steadman, president; R. C. Carter, vice-president; and Miss Louise Miller, secretary-treasurer. A number of projects for 1959 were outlined, including a sticker emphasizing "land use emphasis week" to be used by bakeries; purchase of a plaque to be awarded to the boy making the highest record in soil and water conservation course during the annual Boys' Conservation School; and investigation of approaches to be used in getting a statewide publication on soil and water conservation activities. At present no publication of this nature is available for distribution to teachers, students and others.

Minnesota Chapter continues to produce, under the chairmanship and editing of W. W. Russell, an excellent Newsletter. Not only are chapter and *SCSA* news and affairs covered but many other aspects of conservation activities and research in the State. The Newsletter has been an effective device for knitting together the many interests represented in the Minnesota chapter.

A squib picked out of the October Newsletter reports a study being made by four soil scientists to determine the best elevation and best time of the year for taking aerial photos for soil survey work. D. K. Woodworth of Owatonna, Minn., was one of the scientists participating in this study.

Show-Me Chapter (Missouri) continues its monthly Newsletter and shares the editing around the State to get better coverage. A fine "interest" article on Indian signs in the Loutre Valley of the Montgomery SCD in West Central Missouri was prepared by Allan H. Jeffrey. By carbon-14 dating it has been determined that Indians lived in the Loutre valley at least 9,700 years ago. Another "interest" article, in the November Newsletter, is titled, "Soil mapping in the shadow of the New Madrid Earthquake" by Merritt G. Wilbur. From Dec. 16, 1811 continuing through May 5, 1812, some 1,847 shocks of various intensity were recorded for the New Madrid area, and several surrounding states. (We hear that quite soon after Soil Scientist Jeffrey had written this piece, that a minor quake had occurred in the area but not enough to stir up the soils as apparently happened during the severe quakes of the early 1800's.)

Red River Valley Chapter (North Dakota-Minnesota) elected the following officers for 1959 at their annual meeting: President, Irvine Dietrich, Morill Hall, NDAC, Fargo; Vice-President, O. W. Aanstad, Ada, Minnesota; Secretary, Ordean Berg, Area Conservationist, SCS, Fargo. To better serve the area covered by the chapter, it is expected there will be two additional meetings held during 1959, and of course, with top attendance at the annual *SCSA* meeting in Rapid City, South Dakota, August 26-29.

Northern New England Chapter will hold its 1959 meeting in Portland, Maine, in May or June, with the theme, "Land Use for Tomorrow's Living." Each member is asked to bring a guest who may be a prospective member.

All Ohio Chapter met January 19 and 20 at the Youth Center, State Fairgrounds in Columbus, with low-cost dormitory facilities available. Business session followed the dinner meeting, evening of January 19.

Oklahoma Council of Chapters will hold its 1959 meeting at Stillwater. Edd Roberts, extension soil conservationist, Oklahoma State University, Stillwater, was elected president of the Council for 1959.

Northwest Oklahoma Chapter held its organizational meeting in November and elected the following officers for 1959: Chairman, Earl Nance; Vice-Chairman, W. R. Kneebone; Secretary, Joy Smith; and Treasurer, Jack Engleman. In addition to the overall state meeting, the chapter will hold four meetings during 1959. Membership in the chapter includes those from SCS, ARS, Stock Exchange Bank, Hoover Equipment Company, ASC, and Soil Conservation Districts.

South Central Oklahoma Chapter has worked out a very fine method of getting delinquent members back and obtaining new members. Chapter goal for new members was 50; got 70. Had 27 delinquents; got 25 back. Each of the 12 counties had a membership chairman, headed up by Elmer O. Graham. The 14 Club 5 individuals were on a TV program shown receiving their buttons. Chairman Graham expects there are at least 100 more potential members to be obtained—this estimate made on a "market analysis" of the 12 counties.

An unusual part of the chapter's 1958 program was the leasing of a goose hunting area, with an invitation to members of other Oklahoma chapters to participate.

On its past spring meeting (1958) the chapter held a very fine family field day on the Wichita Mountains Wildlife Refuge where an abundance of wildlife was seen —including a prairie dog town and Texas Longhorn cattle, which many of the members had not seen before. The U. S. Wildlife Service is a cooperator with the Comanche County Soil Conservation District and through aid from SCS technicians have done a splendid job in restoring native range grasses on what had been previously a badly overstocked part of the refuge.

The JOURNAL thanks Walter Jessee, **chapter reporter,** for having sent in a very fine report along with photographs.

Keystone Chapter (Central Pennsylvania) presented Raymond D. Shaffer of Dalmatia, Pennsylvania, with a plaque honoring him as the State's top conservationist for the year. Officers for 1959 are: David Unger, chairman; Melvin Blish, vice-chairman; James Wise, secretary-treasurer; and Harold Geiger, Lloyd Ireland, and Mark Shuman, executive council. One of the functions of the vice-chairman is to lock the conference meeting room doors to insure perfect atendance.

A newsletter, titled, "Keystone Comments", Vol. 1, No. 1, appeared in November. It will be published quarterly; editorial office is SCSA, Room 127A, South Office Building, Harrisburg, Pa. Business, films, field trip, talks (one on flood forecasting by O. D. White of the Weather Bureau), a smorgasbord and square dance rounded out the annual meeting at Potato City.

South Carolina Chapter held a dinner meeting December 1. Some 60 persons enjoyed the illustrated lecture on "Water in Asia, Too Much or Too Little" by Dr. George B. Cressey, Maxwell Professor of Geography at Syracuse University. The following is abstracted from a report by Guilbert Graham, chapter chairman and member of the University of South Carolina geography staff:

Seeing and hearing how the Orientals have managed water through the centuries and are managing it today in densely populated portions of the earth was inspiring and thought provoking to our professional conservationists and their guests.

Some of Cressey's publications that would be of interest to conservationists everywhere include:

"Water in the Desert"—Vol. 47, No. 2, June 1957, *Annals of the Assoc. of American Geographers.*

"Land for 2.4 Billion Neighbors"—Vol. 29, Jan. 1953, *Economic Geography,* Clark University, Worcester, Mass.

"Qanats, Karex, and Foggaras"—Vol. XLVIII, No. 1, Jan. 1958, *The Geographic Review.*

Cressey gave us a lot to think about in America where our increasing population and decreasing productive land is creating problems such as long ago faced the Orientals. They have, by hand labor, controlled water and made it serve millions of people. We, too, by mechanical power, are beginning to control water in America. Doubtless we could learn much by observing techniques developed in Asia where climate and landforms from the humid east to the arid southwest have their smaller counterparts in North America.

Utah Chapter held a winter dinner meeting in Salt Lake City. James L. Jacobs was master of ceremonies. Dr. Winn Thorne, director, Utah Experiment Station, talked on "Agriculture in the Soviet Union."

Virginia Chapter published a summary of highlights of its 1958 program and also a full copy of the major address by Dr. Firman Bear given at its 10th annual meeting.

A Soil and Water Use Pow-Wow was held by the **Inland Empire Chapter** (Washington, Idaho) of the *SCSA,* December 29 in Spokane, Washington. A discussion was held on the important soil, water, range and forest conservation problems in the Inland Empire, a business meeting was held, and new officers were elected at the annual meeting, with Tom Templeton of Spokane to serve as chairman for 1959.

Plans for a youth camp for outstanding agricultural students to be held this spring were firmed.

James Rabdau of Moscow, Idaho, received the chapter's Inland Empire plaque for his promotion of strip cropping. Dr. Henry Smith, professor of soils at Washington State College, was the banquet speaker, illustrating his talk on area soils structure with slides.

West Virginia Chapter held a three-day meeting at the famed 4-H camp, Jackson's Mill this fall. Business and *SCSA* items were mixed into the program so that there was greater participation by all present. Too often an important business meeting is tacked onto the end of a meeting with the result that too many members have gone on home. West Virginia seems to have made an improvement in programming.

Wisconsin Chapter held a combined field trip and "paper" meeting November 7 with "soil and native vegetation of Southwestern Wisconsin" serving as the background. A morning field trip to view examples of natural prairie and maple woodland communities was conducted by Prof. Russell Wagner of Platteville State College. In the afternoon three papers were given: "Native vegetation of Wisconsin—its origin and development" (John T. Curtis, University of Wisconsin); "Soils of S.W. Wisconsin—origin and relation to past vegetative cover" (Francis D. Hole, University of Wisconsin and Wisconsin Soils Survey Division); "Natural areas—their purpose, value and need for preservation" (Hugh H. Iltis, University of Wisconsin). Discussion and summary was led by William DeYoung, State Soil Scientist, SCS.

CONVENTION ARRANGEMENTS

Local Arrangements Committees have been appointed by the **South Dakota Chapter** for the 1959 *SCSA* meeting to be held in Rapid City, August 26-29 and will be chairmanned by: Finance, Ross Davies and Raymond Lund; Facilities, Grounds, Exhibits, Mike Craig; Hospitality, Transportation, Snack Bar, Ole Claflin and Duane Moxon; Womens Activities, Mrs. Harland Means, Mrs. Henry Frawley, Mrs. Mike Craig, and Mrs. Ralph Cole; Tours, Maps, Information, Harry Woodward; Publicity, Pat Dixon and Tom Pozarnsky; Reservations and Registration, Howard Geers; Entertainment and Barbeque, Ray Huxtable and Tony Krebs.

A copy of the chapter's newsletter, "The Conservationist", appeared on the JOURNAL desk late in December. It is an excellent newsletter.

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The 1959 convention is shaping up fast. Suggestions should be sent to H. G. Bobst, Program Chairman, Room 134, S. 12th St., Lincoln 8, Nebraska.

NEWS OF MEMBERS

Al Foster, Milwaukee, Wis., and **Ruth L. Hine** are putting their editorial skills to work on proposed *Society* publications. Ruth edits a very fine Wisconsin *SCSA* chapter newsletter.

Ruall O. Cole, executive secretary of the Indiana State Soil Conservation Committee was featured in the "Let's Get Acquainted" column of the November Hoosier Chapter News.

A Soil and Water Conservation subcommission has been established in the International Union for Conservation. **Edward H. Graham** was appointed to the IUC Governing Board and as president of the IUC Commission on Ecology.

William H. "Bill" Brown has been named director of the Department of Natural Resources for the Illinois Agricultural Association in Chicago. Bill recently edited the first issue of "Insight", a one-page informative bulletin.

Allan J. Collins of Durham, New Hampshire, has been appointed state conservationist for the SCS in Michigan where he will administer technical assistance to 75 districts, currently serving 33,000 farmer cooperators. Collins has been state conservationist in New Hampshire since 1945. In his work in this state he cooperated closely with the N. New England Chapter of *SCSA*, conservation agencies and organizations, particularly in developing conservation guides and other educational materials. He has made his staff available for teachers' workshops and the annual statewide youth conservation camp which is now in its 12th year.

Blaine Halliday, assistant state supervisor, SCS, Reno, Nevada, has been granted a fellowship at Harvard for this school year. Halliday is an 11-year member of the Society.

Mayhew M. Clark, member of the Hoosier *SCSA* Chapter (Indiana), has joined the Plastics Division of Visking Company, Division of Union Carbide Corporation, Terre Haute, Indiana, as a technical sales representative in the agricultural field.

Melville H. Cohee, SCS, was an honored guest at the 1958 Wisconsin State Fair, where "Outstanding Farmers" were saluted. Mel, whose farm is at Oregon, Wis., had been chosen as an "Outstanding Farmer" by the local Future Farmers of America chapter.

Sam Polston, Ken Harris and **Mike Carlton** are sparking the South Florida Sub-Chapter of *SCSA* and have produced a printed newsletter.

Bill Wertz, USDA soil scientist from Batavia, New York, has transferred to the U. S. Forest Service to head up some work in the Middle West.

Herb Walker, Syracuse, New York, is one of the Washington Committee to select winners of the Distinguished and Superior Service awards given by the USDA.

Dr. Charles E. Kellogg, SCS, was chairman of a soils team of six who recently spent about one month in the USSR in connection with a cultural exchange program.

Harry Porter's (New York *SCSA* member) article on "Rhizomes in Tall Fescue" appeared in Vol. 50 of the *Agronomy Journal.*

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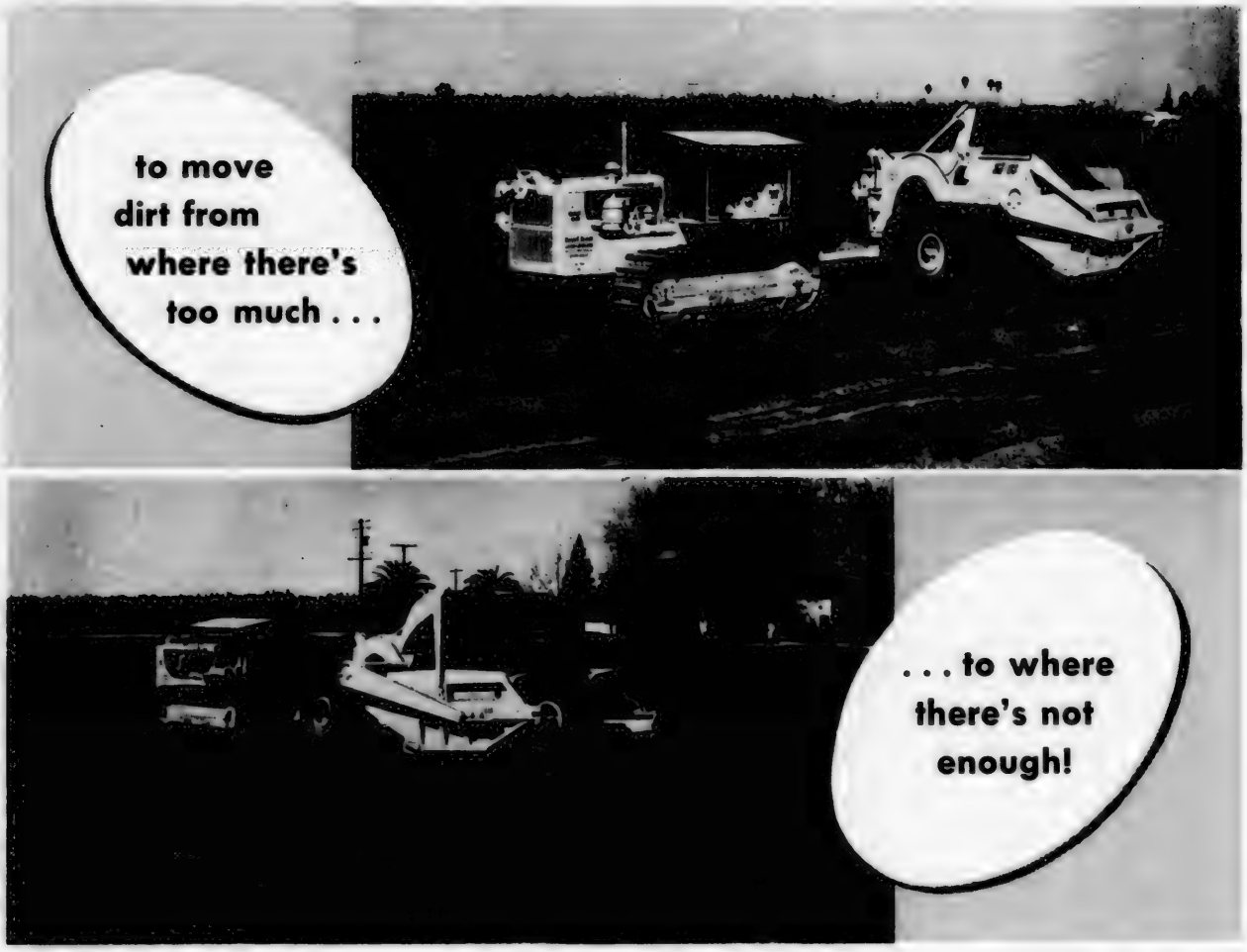

This is the big challenge facing today's conservationist: the job of bringing the seedbed up on a par with the rest of the farm program—with hybrids, fertilizers, insecticides, miracle drugs. For years we've assumed that little could be done about changing the face of farms. Land was cleared, tiled or ditched . . . but basically it was left the way we found it.

Today, many farmers strip hundreds of tons of earth from the high spots, and deposit them in the low places to provide good drainage and uniform water coverage. Some are even "trading dirt"—blending heavy and light soils to improve soil structure. There is virtually no limit to the capacity to improve the seedbeds.

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NEWS OF MEMBERS

William H. Pringle, *SCSA* member, in Pierre, South Dakota, is currently serving as national president of the Izaak Walton League of America. The Izaak Waltons have instituted two very fine outdoor programs, starting in 1958: one deals with hunter safety and hunting manners; the other with a program of working with local farmers to make the federal Soil Bank plan work for better fishing and hunting. Details of these two well-conceived programs can be obtained from the League's national office, 1326 Waukegan Road, Glenview, Illinois.

William M. Briggs is serving as a plant materials technician, SCS, in Indiana and Ohio. Bill's status was incorrectly given in a news release announcing that he had received a *Society Commendation*.

L. G. Hines of Dartmouth College and a writer of a number of reviews in the JOURNAL and a past member of the Editorial Board was one of the winners in an essay contest sponsored by the Committee for Economic Development. This contest was described briefly on page 284 of the November 1959 JOURNAL.

Thomas E. Hamilton assumed his duties November 1 as director of the Soil Bank Division of the CSS; he has been associated with the Conservation Reserve program since 1956.

Paul Zwerman and **Julian Prudeanu** of Cornell have an article in Volume 50 of the "Agronomy Journal" on the relationship between land characteristics and conservation practices established.

James Schwoegler, Monroe, Wis., assisted the Boy Scouts in preparing a Green County fair exhibit on soil and water conservation.

Julien J. Proskauer (*right*) receives his President's Citation plaque from H. W. Pritchard at the Des Moines SCSA office.

James W. Hammett, Louisiana deputy state conservation, succeeds **Colin D. Gunn** as state conservationist at Gainesville, Florida, and **Raymond S. Brown,** Wisconsin deputy state conservation, succeeds **T. C. Kennard** as state conservationist at Columbus, Ohio. **Allan J. Collins** has moved from Durham, New Hampshire, to East Lansing, Michigan, to succeed the late **E. C. Sackrider. Kenneth E. Grant,** New Hampshire deputy state conservationist and a *Society* member, will replace Collins. Hammett, Gunn, Brown, Kennard and Collins are all charter members of the *Society*.

Charter member **Hill Riek** of Billings, Montana, is currently serving as president of the Montana Conservation Council. Riek is area conservationist with the SCS.

Claude D. Kelley of Atmore, Alabama has been selected to serve as director of the Alabama Department of Conservation. For the past nine years Kelley has served as president of the National Wildlife Federation.

NECROLOGY

Waters S. Davis, Jr., Treasurer, Director, and Past President of the National Association of Soil Conservation Districts, died November 15 after a long illness at the age of 59. Davis, who made his home in League City, Texas, had been a *Society* member since 1950 and an honorary member since 1952.

William M. Morris, Pope, Mississippi, passed away September 30, 1958. Morris was an engineering aid for the SCS and a Mississippi Chapter member.

L. O. Page, Raleigh, North Carolina, died this past year.

William D. Poe, Raleigh, North Carolina, died this past year.

Charles H. Trott was affiliated with the Navy Department, Bureau of Yards and Docks in Washington, D. C., until the time of his death in July of this year. Trott had been a member of the *Society* since 1951.

Julien J. Proskauer, president of the Wm. C. Popper Co., New York, died December 18. His company was the *Society's* first sustaining institutional member, and publisher of the two cartoon-style booklets, *The Wonder of Water* and *The Story of the Land*.

Recently, in recognition of his services to the *Society*, Julien Proskauer came to Des Moines to receive his plaque of the President's Citation. He had been unable to come to Asheville.

After World War I, Proskauer flew in and managed his own Flying Circus; later he replaced Houdini on a series of stage appearances, after the latter's death. His interest in soil and conservation affairs was deep-felt and he did not hold back in letting the trade-circle in which he operated know this.

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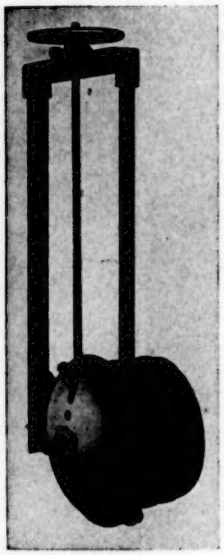

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New Method of Inoculating Can Mean Difference Between Success and Failure of Some Legumes

EFFECTIVE nodulation of small-seeded legumes is not always easy to achieve, even with today's improved inoculants. This is especially true with some of the small-seeded legumes such as Birdsfoot trefoil which are planted on the surface of the soil.

Hot, dry soils make effective inoculation difficult to attain in many areas and with many legumes. The bacteria die off before the seeds germinate and cannot benefit plant growth.

But, a new product, Nitra-Coat, can now be "teamed up" with legume inoculants to help assure effective nodulation in the face of these difficulties. Nitra-Coat used in the inoculant slurry can greatly improve inoculation results on the hard-to-inoculate legumes and on all legumes planted under adverse conditions.

What Nitra-Coat Does — Nitra-Coat is a special formulation of water-soluble gums, bacteria nutrients and calcium compounds. When mixed in the inoculant-and-water slurry, it adds adhesiveness to the inoculant and also prolongs bacteria life on the seed. The gums bind the inoculant tightly to the seed with a smooth, fast-drying coat — protect the bacteria. As a result, seeds flow smoothly through drills without clogging — the inoculant does not dust off.

Permits Inoculation Well in Advance of Planting — The life-sustaining nutrients and the adhesive qualities of Nitra-Coat give the legume farmer another big advantage — especially with large, easy-to-inoculate seeds such as soybeans or peas. Seeds may be planted as much as two weeks after inoculation and still attain adequate nodulation. This eliminates the need to re-inoculate when planting has been delayed by inclement weather, and, of course, makes it unnecessary to do the inoculating right on planting day. Valuable planting time is saved; the inoculating becomes a "rainy day" job.

This feature, therefore, discourages the "half-way" inoculation methods often used because of pressure of time. It will encourage many farmers previously skipping inoculation entirely to take full advantage of this sound farming practice.

Low Cost — The Nitra-Coat method of inoculation adds little more labor to preparing the slurry, and the expense is negligible. The added cost of Nitra-Coat averages from 5 to 10 cents per acre. No special mixing equipment is required.

Because the time factor in inoculation has been, for the most part, eliminated with Nitra-Coat, legume seed can now be custom inoculated by seed dealers. The stabilizing effect of Nitra-Coat in the slurry makes it practical to use slurry treaters and other large-volume mixers. Seed can be inoculated quickly, simply, at low cost to the farmer — and most important, more thoroughly than he would be likely to do himself.

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NITRAGIN

Soil specialists say it's time for . . .

A new look at soil fertility problems

UNTIL recently, soil specialists, agronomists, county agents and vocational agriculture teachers had a relatively uncomplicated task when giving advice on soil fertility. The story that needed telling was about nitrogen, potassium, and phosphorous . . . the basic "big three" in soil elements.

But today the problem has become more complicated. The basic N-P-K story is no longer enough. There are two main reasons for this.

Fighting the cost-price squeeze

To stay in the farming business and make a good living in today's economy, every known skill must be brought to bear. It's a matter of scratching hard for bonus yields which represent pure profit. Just "good" harvests aren't enough. Making a better profit is more and more a matter of farming *smarter* . . . not simply *harder*.

Fertility problems have changed

For instance, old methods of maintaining fertility are no longer adequate. For decades we needed only to replace the soil elements which crops used in the greatest quantities.

But now there are clear signals that the elements plants use only in tiny quantities are beginning to run out. They loom more and more important with every harvest . . . and call for new methods of soil management, new alertness on the part of all of us who are concerned with soil fertility.

The magnesium problem

One element which is coming into new importance is magnesium. Largely ignored for years, it now is often called the fourth plant food element . . . and soil supplies are steadily decreasing.

Crops remove magnesium at a startling rate. For example, a ton of alfalfa hay takes about 16 pounds of magnesium oxide equivalent with it.

Also, high-analysis fertilizer adds large quantities of sulfates, chlorides, and nitrates to the soil . . . which combine with soil magnesium to form soluble salts. Rain leaches these salts away and more magnesium is lost. An estimated 5 million tons of magnesium is carried down the Mississippi River each year.

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Crop needs

These losses add up over a period of time. Yet every growing plant needs magnesium. It is a vital part of chlorophyll. Seed development often requires even more magnesium than phosphorous . . . and sufficient magnesium enables crops to make better use of other plant foods since magnesium is a carrier of phosphorous to growing and fruiting parts of the plant.

Magnesium also is needed to stimulate growth of soil bacteria and to aid fixation of nitrogen by legumes. Finally, a maximum supply of magnesium available to plants will increase disease resistance by assuring balanced nutrition. Result: plants can synthesize disease-resisting antibodies.

Deficiency signs in corn

Actually many crops have suffered because of magnesium shortages for years. By the time diagnosis is possible . . . through visible symptoms . . . profits have been cut for several harvests. Visible symptoms in corn first show up as a purplish color on the lower leaves near the margins and about halfway between the tip and the base. As the problem increases, parallel yellow and green stripes run the length of the older leaves. This symptom gradually progresses up the plant.

Small grains

In the case of small grains, magnesium deficiency symptoms include light yellow to white stripes which appear between the veins. Shortages in corn and small grains have been noted in many Southern and Eastern states . . . and recent reports indicate the problem is spreading into the Midwest.

Legumes are big users

Magnesium is important to top yields and profits for legume growers. Trouble signs are similar to other crops. Leaves lose color between the veins, turning a light yellow. Nodulation and nitrogen fixation suffer, too. Soybeans, for example, fixed over twice as much nitrogen when available soil magnesium was doubled.

Tobacco needs magnesium

Magnesium deficiency in tobacco commonly is called "sand drown" since symptoms are easier to see in wet seasons and on sandy soil. Loss of green color begins in the lower leaves between the veins. Blanched areas of affected leaves tend to turn a light yellow or almost pure white. The leaves, however, remain smooth and tissue which has lost color stays alive. Magnesium-poor soil can reduce yields by as much as one-fourth . . . and critically reduce tobacco quality.

How to correct

Dolomitic limestone can be added to the soil as a way to overcome magnesium deficiencies. But Double Sulphate of Potash-Magnesia works even better. It corrects shortages and at the same time builds up dwindling reserves of sulphur . . . a hard-to-spot need because the deficiency signs so closely resemble nitrogen starvation.

To be completely effective for cropping and for mixing, the ideal magnesium form is water-soluble and granular in structure. International Minerals makes water-soluble magnesium available under the trade name Sul-Po-Mag*. It has the formula flexibility to fit it to the needs of specific crops and also is custom-tailored for direct application where only potash and magnesium fertilization is needed.

Granular in form, Sul-Po-Mag stays in the soil longer to feed crops longer and sustain growth over the season.

Full details available

You can have complete information on how Sul-Po-Mag solves plant nutrition problems. For copies of our free Magnesium Booklet which discusses application to specific crops, write International Minerals and Chemical Corp., Potash Division, Administrative Center, Skokie, Illinois.

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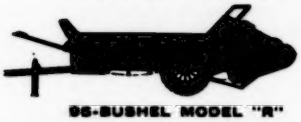

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Good weight distribution on spreader and tractor wheels is also essential to fast, easy operation. And, John Deere Spreaders are outstanding in this respect. Weight is always properly distributed whether the spreader is completely full or empty.

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